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SCHOOL BUS SECURITY: A CASE FOR REGULATIONS TO IMPROVE CHILD SAFETY

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SCHOOL BUS SECURITY: A CASE FOR REGULATIONS TO IMPROVE CHILD SAFETY

by

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December 2018

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Each day, millions of parents send their children to school on public school buses under the assumption of their safety. In the United States, school buses transport more passengers each day than all other modes of mass transit combined. The lack of minimum security standards governing the school bus transportation industry has created a deep security void in the homeland security enterprise. Given the threats that U.S. mass transit systems face, more must be done to ensure the safety and security of children during their daily commute on school buses. This thesis examines the security void through an analysis of critical infrastructure methodologies and security strategies deployed worldwide to secure other modes of transportation. These methodologies form the basis for recommending new federal transportation security regulations that cover the school bus industry. The implementation of these proposed regulations uses a multi-layered security approach to ensure security is enhanced at all levels of the school bus transportation system. Security regulations provide a baseline standard for the entire school bus industry that will help safeguard the most precious commodity, children.

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SCHOOL BUS SECURITY: A CASE FOR REGULATIONS TO IMPROVE CHILD SAFETY

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ABSTRACT

Each day, millions of parents send their children to school on public school buses under the assumption of their safety. In the United States, school buses transport more passengers each day than all other modes of mass transit combined. The lack of minimum security standards governing the school bus transportation industry has created a deep security void in the homeland security enterprise. Given the threats that U.S. mass transit systems face, more must be done to ensure the safety and security of children during their daily commute on school buses. This thesis examines the security void through an analysis of critical infrastructure methodologies and security strategies deployed worldwide to secure other modes of transportation. These methodologies form the basis for recommending new federal transportation security regulations that cover the school bus industry. The implementation of these proposed regulations uses a multi-layered security approach to ensure security is enhanced at all levels of the school bus transportation system. Security regulations provide a baseline standard for the entire school bus industry that will help safeguard the most precious commodity, children.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACLU	American Civil Liberties Union
AD	attacker-defender
APS	Albuquerque Public Schools
B-R	Bridgewater-Raynham
BASE	Baseline Assessment for Security Enhancement
CAFE	Corporate Average Fuel Economy
CCTV	closed-circuit television
CDL	commercial driver's license
DCS	Dallas County Schools
DHS	Department of Homeland Security
DOT	Department of Transportation
DUI	driving under the influence
EXIS	Exercise Information System
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FT	fault tree
FTA	fault tree analysis
GPS	global positioning system
IDF	Israel Defense Forces
IED	improvised explosive device
MCES	Missouri Center for Education and Safety
mpg	miles per gallon
NAPTS	National Association of Pupil Transportation Services
NMPEDSTB	New Mexico Public Education Department's School Transportation Bureau
NRA	National Rifle Association
NSTA	National School Transportation Association
RFID	radio frequency identification
RSC	rail security coordinator
SCB	Surface Compliance Branch

SRO	school resource officer
STS	Suffolk Transportation Service
TIH	toxic inhalation hazard
TSA	Transportation Security Administration
TVC	threat vulnerability consequence
UAE	United Arab Emirates

EXECUTIVE SUMMARY

According to Wendell Cox of New Geography, "The school bus system is the largest mass transportation system in the nation."[1] The security of the U.S. school transportation system is a homeland security issue due to the size of the system and the impact an attack would have on the country and citizens. The threat persists because school buses are a vital mode of transportation, operate on and interact with some of the nation's critical infrastructure, and carry the most precious cargo—children. Estimates show that the school bus system transports twice as many people as all other transit modes combined in a day, yet no minimum security standards exist in the industry. The implementation of federal security regulations focusing on multiple facets of the school bus sector will provide a uniform minimum standard and boost the security posture of the entire industry.

Fortunately, Americans have not witnessed a terrorist attack directed at a school bus, but the London, Madrid, and Brussels attacks unequivocally prove that civilian mass transit conveyances are prime targets for terrorist activity. The lack of significant incidents in the United States does not suggest there is no threat; school buses remain a soft target. Osama bin Laden suggested that an attack against American children would cause the most significant destruction, panic, and fear. Furthermore, the recent surge in domestic school violence highlights the legitimacy of the threat facing U.S. school children. Although the threat to school buses may not be imminent, it is a real concern, and the school bus industry needs to adopt enhanced measures of security to harden the target.

In 2005, the Transportation Security Administration created the Surface Compliance Branch to provide oversight to an area of transportation that had minimal security supervision. The rail transportation security regulation (49 C.F.R. § 1580) has been implemented to ensure mass transit, passenger railroads, and freight railroads report specific security events, maintain designated security points of contact, and account for the

[1] Wendell Cox, "School Buses: America's Largest Transit System," New Geography, December 19, 2014, http://www.newgeography.com/content/004801-school-buses-americas-largest-transit-system.

location and chain of custody for certain rail cars containing toxic inhalation hazards.[2] This regulation has been successful in enhancing overall security in the mass transit and railroad industries, which suggests that similar successes and security enhancements are obtainable in the school bus transportation industry.

The school bus transportation system in the United States is relatively unique compared to the rest of the world, but the international community does offer some potential security strategies that could be implemented within the American school bus system. School bus attacks may not be prevalent throughout the world, but foreign and domestic incidents highlight the legitimacy of the threats that face the school bus transportation industry. These incidents range from the discovery of school information at terrorist camps, to attacks with dangerous weapons, to potential kidnappings and hijackings, to vehicle ramming, to international rocket attacks. Threats are always evolving, and it is unlikely that transportation systems will be able to mitigate every vulnerability they face. However, with the implementation of security regulations focused on mitigation strategies—such as training, public outreach, partnerships, physical security measures, technology, and security inspections—school bus organizations can be better prepared to employ proactive security measures and effective response techniques.

Keeping children safe on the school bus has and always will be the ultimate priority for school bus companies and school districts. American school bus companies and school districts are beginning to understand that common behavioral issues and nuisance concerns seen on their school buses are just the tip of the iceberg when it comes to security. According to the National School Safety and Security Services, this change in philosophy is leading to "school transportation officials are increasingly learning that school bus security and emergency planning is as … important as school security and crisis planning in the actual school buildings."[3] Throughout the country, discussions are taking place about school bus security adaptations with the focus placed on school bus drivers, outreach

[2] Rail Transportation Security, 49 C.F.R. 1580 (2010), https://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol9/pdf/CFR-2011-title49-vol9-part1580.pdf.

[3] "School Bus Transportation Security," National School Safety and Security Services, accessed August 7, 2017, http://www.schoolsecurity.org/resource/school-bus-security/.

activities, and technology. These three areas can help to protect children through proactive security solutions. The key is to install a minimum security standard, using these focus areas, for school bus transportation systems across the country to ensure an equal level of security for all children.

An analysis of the school bus transportation system's functionality is necessary to begin developing a minimum security standard. School bus systems should be measuring performance based on the success rates of transporting students from their points of entry to school and extracurricular activities and then back to their homes without encountering a security incident. Once a measure of performance and expectations are established, school bus companies can begin to assess the risk their system faces by utilizing the risk equation: *Risk = Threat* x *Vulnerability* x *Consequence*.

Using this formula requires an agency, first, to identify the potential threats it may face, second, to estimate the system's vulnerability to the threat and the risk of an event happening, and, third, to evaluate the consequences, or costs, of the threat if an event occurs.[4] This formula helps analysts to determine how design features, such as mitigation strategies and physical security measures, will function against various attacks that adversaries may perpetrate. An organization can understand the gaps in its system and then test those vulnerabilities through the use of tools such as game theory, the attacker-defender model, and fault tree analysis. These models allow for the simulation of worst-case scenarios that could disrupt or cripple an entire system. By using these strategies, a school bus company could determine the best courses of action to mitigate security vulnerabilities.

Identifying and then mitigating vulnerabilities through regulation has been successful in other transportation industries, specifically the aviation industry. Federal regulations for aviation security detail the full security responsibilities of the individuals and entities that engage aviation transportation.[5] These regulations explicitly detail the

[4] Norman Ferrier and C. Emdad Haque, "Hazards Risk Assessment Methodology for Emergency Managers: A Standardized Framework for Application," *Natural Hazards* 28, no. 2–3 (March 2003): 20.

[5] Civil Aviation Security: General Rules, Transportation Security Administration, 49 C.F.R. 1540 (2010); Airport Security, 49 C.F.R. 1542 (2010); and Aircraft Operator Security: Air Carriers and Commercial Operators, 49 C.F.R. 1544 (2010).

required minimum security standards within the aviation industry. Comprehensive federal transportation security regulations have been employed in the aviation industry since 9/11 and, along with improved technology, have made air travel the safest it has ever been.[6] Given that surface modes of transportation, specifically school bus transportation, are responsible for transporting more than 10 times the number of aviation passengers on a daily basis, it is time that regulations be enacted.

The recent surge of school shootings has led to demands for increased security at schools, but protecting American schools does not begin or stop at the school's property line; it needs to be carried all the way through to school bus operations. Creating regulations will require schools and school bus companies to implement mitigation strategies to achieve the goal of protecting students. Comprehensive security regulations for school buses should mimic the design in the aviation industry. Enacting regulations that cover security plans, training, drills and exercises, physical security measures, inspection protocols, technology, and bus driver requirements will create a robust security system that proactively mitigates and prevents vulnerabilities.

The school bus transportation industry is a critical piece of infrastructure that should provide safe and secure transport for children every day. Although, to date, the security of our school bus transportation system has not been tested, events around the world indicate that the potential threat persists. The continued threat and the likely horrific consequences of an attack or catastrophic system failure pose enough of a risk to change the industry paradigm and formulate security regulations for school buses. Enacting federal security regulations for school bus transportation sends the message that the United States government is serious about protecting the thing we treasure the most—children.

[6] Richard Westcott, "Despite the Headlines Air Travel Is Safer Than Ever," BBC, February 4, 2015, https://www.bbc.com/news/business-31133246.

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I saved the best for last—my two boys, Braden and Owen. You two were my inspiration for this thesis. One day you will both be on a school bus, and I want to ensure that you are as safe and secure as humanly possible. You are both getting so big so fast,

and I’m so proud of everything you are becoming. If you put your minds to it, you can accomplish anything.

I. INTRODUCTION

In his 1998 fatwa, Osama bin Laden stated, "Most Americans value their children above everything else."[1] American parents will do anything to protect their children and always worry about their safety. A study by Christie Barnes, author of *The Paranoid Parents Guide*, shows the top fears for parents include kidnapping, school shooters, and terrorists.[2] Even though these are not the most probable scenarios, they do generate significant attention in the media and political realm when they do occur.[3]

The shootings that took place at Columbine, Sandy Hook, and Parkland have led to increased security policies and measures at schools throughout the country.[4] With strategies in place to make schools safer theoretically, it is now time to enhance security on school buses. Whether it be by utilizing free assessments, spending money on security infrastructure, increasing security awareness training, or partnering with local law enforcement, school districts and school bus companies should begin or continue to secure their school buses to protect children from potential threats other than common unruly school bus behavior.

The security of the U.S. school transportation system is a homeland security issue due to the size of the system and the impact it would have on the country and citizens if terrorists attacked it. The threat persists because school buses are a crucial mode of transportation, operate on and interact with some of the nation's critical infrastructure, and carry some of the most precious cargo—children. According to Wendell Cox, "The school bus system is the largest mass transportation system in the nation."[5] Estimates show that

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[1] John Fisher, "The Next Terror Attack in America," Walden University, 5, accessed August 8, 2017, http://waldenu.academia.edu/Departments/Human_Services_Criminal_Justice/Documents.

[2] Meagen Voss, "5 Worries Parents Should Drop," NPR, August 30, 2010, https://www.npr.org/sections/health-shots/2010/08/30/129531631/5-worries-parents-should-drop-and-5-they-should.

[3] Voss.

[4] Mary Beth Marklein, "Schools Tighten Security after Sandy Hook," *USA Today*, September 24, 2013, https://www.usatoday.com/story/news/nation/2013/09/23/schools-step-up-security-measures-in-wake-of-sandy-hook/2844423/.

[5] Wendell Cox, "School Buses: America's Largest Transit System," New Geography, December 19, 2014, http://www.newgeography.com/content/004801-school-buses-americas-largest-transit-system.

the school bus system transports nearly twice as many people as all other transit modes combined in a day (see Figure 1).

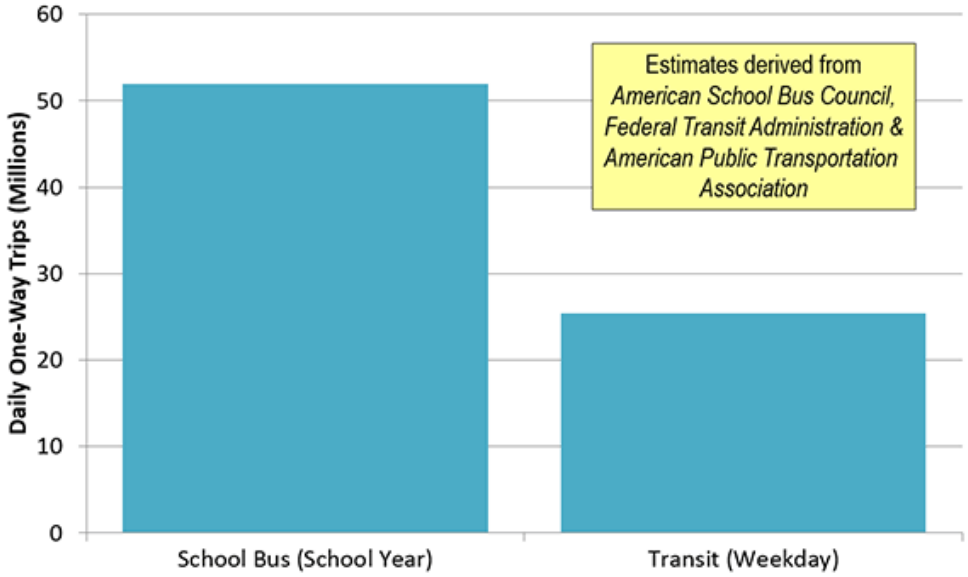

Figure 1. Estimated Daily Ridership of School Buses and U.S. Transit, 2010[6]

The school bus industry operates approximately 480,000 buses and carries around 50 million students per school day, according to this 2010 study. The school bus fleet size in America is almost 2.5 times larger than all other forms of transportation combined.[7] With a system this large, there is the potential for a homeland security incident. The school bus transportation system is making strides to enhance security by improving security awareness and background checks for bus drivers, outreach activities and programs, and technology.

Even with this huge daily ridership, the school bus system is still relatively safe. Only 1 percent of child transportation fatalities during school hours occurred on school

[6] Cox, "School Buses: America's Largest Transit System."

[7] Cox.

buses while 58 percent occurred in a vehicle being driven by a teenager.[8] These numbers are primarily safety-based, and much can still be done to further reduce security risks that potentially face our children on a daily basis. Federal, state, and local governments, along with school bus companies and school districts, have begun efforts to increase school bus security.[9] Bolstering school bus security will have a direct impact on securing the homeland by ensuring that children are safe when being transported to and from school.

As evidenced by the 2016 Brussels attacks and Osama bin Laden's comments in his 1998 fatwa, the threat to public transportation—and thus school bus transportation—is real and encompasses much more than standard crimes such as vandalism and theft.[10] Industry officials are beginning to recognize how vulnerable school bus systems are due to the high visibility of the buses, insufficient security training, route predictability, and a lack of resources.[11] Consequently, the National Association of State Directors of Pupil Transportation Services has suggested that the Department of Homeland Security place schools and school bus transportation into its highest risk category.[12]

Clive Blackwell of the Information Security Group writes about the need for a multi-layered security approach for dealing with complex systems, focusing on people, technology, and physical barriers.[13] Aviation and passenger-rail transportation systems currently employ a multi-layered approach as they optimize passenger safety and security, but this approach is required by federal regulation. School bus transportation is no

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[8] "FAQ," American School Bus Council, accessed October 16, 2018, http://www.americanschoolbuscouncil.org/school-bus-information-and-statistics/faq#how-safe-is-the-school-bus.

[9] Christopher Hann, "Rethinking School Bus Safety," District Administration, July 1, 2007, https://www.districtadministration.com/article/rethinking-school-bus-safety.

[10] Hann, "Rethinking School Bus Safety"; and James Blue, "Keep Security on the Front Burner," School Bus Fleet, May 3, 2016, http://www.schoolbusfleet.com/article/712062/keep-security-on-the-front-burner.

[11] National Association of State Directors of Pupil Transportation Services, *Pupil Transportation System Security: Resources and Approaches* (Sacramento: National Association of State Directors of Pupil Transportation Services, June 2004).

[12] National Association of State Directors of Pupil Transportation Services, "Pupil Transportation Security System—More Attention from Terrorists Demands More Attention from Us" (position paper, January 2005), http://www.nasdpts.org/Documents/Paper-SecurityJan05.pdf.

[13] Clive Blackwell, "A Multi-Layered Security Architecture for Modelling Complex Systems," in *Proceedings of the 4th Annual Workshop on Cyber Security and Information Intelligence Research* (New York: ACM Press, 2008), 1, https://doi.org/10.1145/1413140.1413180.

different; the transport of millions of students on a daily basis is a complex system. However, to date, no federal regulations dictate security measures for school buses. The implementation of federal security regulations that focus on multiple facets of the school bus sector will provide a minimum standard and boost the security posture of the entire industry. By design and regulation, aviation security begins before passengers even arrive at the terminal. The creation of federal security regulations for the school bus industry will ensure similar proactive preventive measures are taking place on the school buses, in the community, and at school bus yards and facilities.

A. PROBLEM STATEMENT

In 2013, in Dale County, Alabama, school bus driver Charles Poland was killed while fighting off a shooter who had invaded his bus. His actions allowed the majority of children on his bus to escape through the back door.[14] The gunman—who barricaded himself in a homemade bunker along with the one child he managed to grab after killing Poland—appeared to have had vague plans for a televised suicide when he boarded the bus and demanded the driver let all of the children go with him.[15] In the end, he was killed by law enforcement; his five-year-old hostage escaped. By all accounts, it was a gruesome crime perpetrated by a man with a record of violence and instability. In 2011, Hamas fired an anti-tank missile from Gaza, hitting an Israeli school bus—a planned terrorist attack.[16] While rockets are unlikely to be fired at American school buses, the attack on an Israeli school bus shows that the threat against school buses is legitimate and has the potential to affect the United States.

Every day, millions of children are transported to and from school and extracurricular school functions on school buses.[17] However, unlike the aviation, freight

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[14] Greg Bothelo, "Slain Alabama Bus Driver Called a Hero for Protecting His 'Youngins','" CNN, February 1, 2013, http://www.cnn.com/2013/02/01/us/alabama-slain-bus-driver/index.html.

[15] Michael M. Phillips, "Inside an FBI Hostage Crisis: A Stolen Boy, an Angry Loner, an Underground Bunker," *Wall Street Journal*, accessed March 5, 2018, http://graphics.wsj.com/hostage/.

[16] Isabel Kershner, "Missile from Gaza Hits School Bus," *New York Times*, April 7, 2011, https://www.nytimes.com/2011/04/08/world/middleeast/08gaza.html.

[17] Cox, "School Buses: America's Largest Transit System."

rail, passenger rail, and mass transit sectors, there are no federal security regulations governing school bus transportation. This lack of regulation leads to school buses being vulnerable to potential terrorist attacks, security incidents, and natural hazards. Currently, the Transportation Security Administration (TSA) engages the school bus sector with a variety of voluntary security programs such as security assessments, security training, and security operations. Considering the effectiveness of these efforts and evaluating the potential impact of security regulations within the school bus sector will help determine how the implementation of regulations would affect vulnerabilities within this sector.

1. Hypothesis

Security regulations focused on enhancing security training; developing and implementing security plans; and testing security plans, processes, and security inspection guidelines will significantly increase the security posture of the entire school bus transportation sector.

2. Focus and Goal

The research focused on determining the effectiveness of current security policies within the school bus transportation sector. It also focused on the efficacy of implementing regulation within this sector. The goal was to determine how security regulations will fill gaps in school bus security throughout the country. To achieve this goal, an analysis of regulations from other transportation sectors was conducted to devise a strategy for creating security regulations that provide tangible benefits for the school bus sector. Potential benefits and drawbacks of security regulations were assessed to gauge the feasibility of implementing these regulations within the school bus sector. Any additional implications discovered through this research factored into the efficacy of applying security regulations into this sector. Ultimately, this research assessed the current shape of the school bus industry's security and developed recommendations to mitigate gaps in security.

B. RESEARCH QUESTIONS

Can the application of critical infrastructure methodologies to school bus security inform new transportation security regulations? Can we determine whether the resulting transportation security regulations increase the overall level of security within the sector?

C. RESEARCH DESIGN

School bus security is presently susceptible to threats both human-made, specifically terrorists and criminals, and natural. Current security regulations within the aviation sector offer a potential starting point for creating school bus regulations. The primary objects of this research were the school bus sector, school bus security policies and their application, and transportation security regulations through the utilization of current security regulations in other modes of transportation.

1. Topic Selection

School bus security, or the lack thereof, is an understudied area within the homeland security enterprise. TSA attempts to work with school bus agencies throughout the country. However, these agencies are not required to meet with TSA or implement its suggested security strategies. A lack of security requirements has led to minimal TSA involvement with the school bus sector of transportation. Threats to school buses persist around the world as demonstrated by the incident in Dale County, Alabama, and another in India.[18] The Indian incident involved a school bus being attacked by a mob who was protesting the release of a film.[19] Moreover, the selection of this topic offers a personal connection. As a parent of two young children, the author understands they will be riding on school buses and wants to offer enhancements to school bus security to ensure that the most effective and efficient security measures are in place to protect them. Each of these areas demonstrates the need for a comprehensive analysis of school bus security.

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[18] Bothelo, "Slain Alabama Bus Driver Called a Hero."

[19] Abhishek Angad and Abhinav Rajput, "Gurgaon Schoolbus Attack: In Village of 18 Accused, Questions Hit a Wall of Denial," *Indian Express* (blog), January 26, 2018, http://indianexpress.com/article/india/padmaavat-protests-gurgaon-school-bus-attack-5039567/.

2. Limitations

This thesis focuses on what is known about transportation security within the school bus sector. Since this is an understudied area, there is less scholarly writing specifically devoted to school buses than there is to other transportation modes such as aviation. The information and data that were available and used in this thesis did not include the entire industry; they looked at specific cases to dissect potential problems within the school bus security field. Because there are no current school bus transportation security regulations, the analysis of security regulations was limited to those of aviation, freight rail, passenger rail, mass transit, and air cargo. Application of security regulations to the school bus sector required extrapolating how potential regulations would affect school buses. The majority of school bus terrorist or security incidents have taken place abroad, where policies, procedures, regulations, and infrastructure may differ from the United States. The recommendations in this thesis focus on policies and procedures for domestic school bus security.

3. Data Sources

Research and analysis for this thesis were conducted through the use of various data sources. The primary data came from federal regulations, scholarly journals, news reports and articles, industry associations, and government resources. News reports from around the world played a vital role in the critical analysis of school bus security and helped to shape recommendations for enhancements. Open-source government reports from, but not limited to, the Government Accountability Office and Department of Homeland Security provided a government perspective on the current state of the school bus sector and suggestions going forward for school bus security.

4. Type of Analysis

This thesis primarily used quantitative analysis to display how the implementation of security regulations will benefit the school bus sector. Current school bus security policies and current federal security regulations have determined where the industry currently stands regarding security and how security standards from other industries have been implemented. Analysis of these standards helped to formulate recommendations for

potential implementation of security regulations for school buses. Recommendations for policy options were derived from a quantitative analysis of TSA regulatory guidelines from industries that currently fall under federal security regulations: aviation, freight rail, passenger rail, mass transit, and air cargo. The data also showed the effectiveness of certain compliance inspections and led to interpretations of how similar security regulations would work for school bus transportation.

5. Output

This thesis emphasizes the lack of security within the school bus transportation sector as well as the potential threats and vulnerabilities that face school bus transportation. From there, this thesis provides an analysis of how federal transportation security regulations are necessary to mitigate vulnerabilities and enhance the safety and security of children on school buses. The final output of this thesis consists of recommendations for lawmakers to contemplate when crafting security regulations or developing other methods to enhance school bus security. Even without the implementation of new security regulations, this thesis provides a foundation to build on as threats and vulnerabilities evolve within the school bus sector.

II. LITERATURE REVIEW AND BACKGROUND

This literature review offers a synopsis—of scholarly journals, government reports and documents, newspaper articles, and industry associations—detailing the various views as well as the benefits and costs of regulation. Ubiquitous regulations in the United States affect industries such as safety and security, finance, automotive, and transportation, to list a few. Business Dictionary defines regulations as an oversight or management system designed to monitor and govern an activity, individual, organization or industry.[20] Various industries debate the efficacy of regulation.

A. INDUSTRY AND REGULATION

In the December 2003 issue of *Economic Affairs*, Joseph Porket posits that regulations exist to avoid chaos and to facilitate survivability or prosperity. He makes the case that even though regulations are necessary, they may result in negative consequences or work against their intended purposes. Porket describes how industry perceives regulation as either restrictive or permissive—with restrictive regulations oppressing flexibility and innovation and permissive regulations encouraging self-regulation and ingenuity.[21]

Scott Farrow and Stuart Shapiro focus on the Department of Homeland Security (DHS)'s economic cost–benefit analysis for budgeting the costs of security regulations. They argue that regulation is necessary; however, DHS's Office of Management and Budget should use probabilities to determine the break-even point for regulation. This point provides sufficient regulation but does not overwhelm DHS budgets, resources, and oversight capabilities. Farrow and Shapiro conclude that the goal should be to develop

[20] "What Is a Regulation?," Business Dictionary, accessed February 9, 2018, http://www.businessdictionary.com/definition/regulation.html.

[21] Joseph L. Porket, "The Pros and Cons of Government Regulation," *Economic Affairs* 23, no. 4 (December 2003): 48–54, https://doi.org/10.1111/j.1468-0270.2003.00444.x.

regulations that prioritize DHS's risk-based security approach and do not overburden regulated parties.[22]

However, Porket argues that other issues, such as political and social consequences, factor into the effectiveness of regulation. Regulations beget tension and conflict and cannot be analyzed solely through a financial or economic lens. Porket finds that when entities are overregulated, the potential negative consequences often outweigh any benefits that specific regulations offer. He concludes that society "needs regulations to survive and prosper," but if regulations are not woven seamlessly into the fabric of a society's political, economic, and social culture, they are bound to create negative consequences for whichever industry is affected.[23]

TSA regulations have not been immune to criticism, especially in the airport environment. Opponents of TSA security procedures and regulations cite pat-down procedures, the Secure Flight Program, and advanced imaging technology as overly invasive and an infringement on an individual's right to privacy.[24] In the *Pepperdine Law Review*, Daniel Harawa further criticizes TSA for its treatment of the elderly, disabled persons, and children. Harawa cites various media reports of certain TSA security regulations that have led to TSA officers abusing their authority. Harawa describes instances in which TSA officers have required women to remove certain body piercings or brassieres due to the underwire, punctured urostomy bags, or forced mothers to drink their breast milk to prove bona fides. Harawa indicates that each of these instances displays how regulations can easily be misconstrued and violates the intent of the regulation.[25] The American Civil Liberties Union (ACLU) has filed multiple lawsuits against TSA alleging that the agency has abused its regulations and violated the Constitution. In one 2009 case,

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[22] Scott Farrow and Stuart Shapiro, "The Benefit-Cost Analysis of Security Focused Regulations," *Journal of Homeland Security and Emergency Management* 6, no. 1 (2009), https://doi.org/10.2202/1547-7355.1482.

[23] Porket, "The Pros and Cons of Government Regulation."

[24] Daniel Harawa, "The Post-TSA Airport: A Constitution Free Zone," *Pepperdine Law Review* 41, no. 1 (2013), https://digitalcommons.pepperdine.edu/cgi/viewcontent.cgi?referer=https://scholar.google.com/scholar?start=10&q=tsa+regulations&hl=en&as_sdt=0,40&httpsredir=1&article=2327&context=plr.

[25] Harawa.

the ACLU sued DHS because TSA officers "questioned and detained" a passenger carrying $4,700 related to his duties working for a political organization.[26] In cases such as these, according to the ACLU and Harawa, TSA regulations are designed to provide security, but unintended consequences display their failures.

Security regulations focused on watch lists have also been a controversial topic. As Justin Florence writes in a 2006 article for the *Yale Law Journal*, watch lists provide security within the transportation industry, but they also cause difficulties for individuals who appear on these lists for no apparent reason. Florence contends that regulations requiring airlines to vet airline passengers against the No-Fly List and terrorist watch lists are essential, proactive measures to ensure the safety and security of aviation travel. Florence also contends that recent TSA regulations utilizing Federal Bureau of Investigation (FBI) background checks have been critical in enhancing security in other modes of transportation, even though the application and registration process is inconvenient. These background checks are used for individuals applying for a hazardous material endorsement, transportation worker identification credentials, and TSA Pre-Check. While Florence points out these positives, he also highlights the inconsistencies and negatives of the same regulations. Florence explains that No-Fly List regulations offer a limited appeal process, making the regulation quite restrictive once an individual gets on the list. He further illustrates the negatives of this regulation due to TSA's and the airline's inability to adequately respond to individuals who have inquired about why they are on a watch list. Florence concludes that it is Congress' job to adapt watch list regulations to ensure they are no longer one-sided.[27]

The security arena is not alone in debating the efficacy of regulations. Throughout Donald Trump's campaign and the first year of his presidency, he touted deregulation as a way to be more business-friendly and to encourage economic growth. The Trump administration has described economic regulations as burdensome and acted to alleviate

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[26] "ACLU Sues DHS Over Unlawful TSA Searches and Detention," American Civil Liberties Union, June 18, 2009, https://www.aclu.org/news/aclu-sues-dhs-over-unlawful-tsa-searches-and-detention.

[27] Justin Florence, "Making the No Fly List Fly: A Due Process Model for Terrorist Watchlists," *Yale Law Journal* 115 (2006), https://www.yalelawjournal.org/pdf/169_68zhixyz.pdf.

the burden by attempting to overturn many of the 527 "significant" regulations passed by the Obama administration in its last year.[28] In their *USA Today* article, Nathan Bomey and Thomas Zambito suggest that regulations and laws slow innovation, which aligns with the Trump administration's philosophy.[29] According to an article in the *Economist*, the Trump administration argues that economic overregulation leads to a high cost of enforcement and stifles competition within the industry.[30] The *Economist* article also suggests that Trump's deregulation strategy has led directly to increased business confidence, especially from small business owners, and record highs in the stock market.[31] Michael Porter and Claas van der Linde contradict the Trump administration's claims in their article for the *Journal of Economic Perspectives*. Porter and van der Linde maintain that regulation leads to competition, especially when innovative ideas are involved, which keeps costs down. The authors discuss how regulations help to foster a level playing field, which drives competition, creates innovative ideas, and stimulates progress. Porter and van der Linde acknowledge that many economists disagree with their assertions but attest that those economists are shortsighted and too focused on the financial aspects of regulations.[32]

While the White House is lauding how deregulation has boosted the stock market and business confidence, Trump's opponents are arguing that deregulation is negatively affecting the environment. As part of Trump's deregulation strategy, the administration has discussed repealing the Clean Power Plan.[33] Advocates for the Clean Power Plan insist not only that this regulation benefits the climate and the health of citizens near power plants

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[28] "An Assessment of the White House's Progress on Deregulation," *Economist*, October 14, 2017, https://www.economist.com/news/business/21730170-donald-trump-has-blocked-new-regulations-ease-repealing-old-ones-will-be-harder.

[29] Nathan Bomey and Thomas Zambito, "Regulators Scramble to Stay Ahead of Self-Driving Cars," *USA Today*, June 25, 2017, https://www.usatoday.com/story/money/cars/2017/06/25/regulators-scramble-stay-ahead-self-driving-cars/100963150/.

[30] "An Assessment of the White House's Progress on Deregulation."

[31] "An Assessment of the White House's Progress on Deregulation."

[32] Michael E. Porter and Claas van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship," *Journal of Economic Perspectives* 9, no. 4 (1995): 97–118.

[33] Alan Levin and Ari Natter, "Trump Stretches Meaning of Deregulation in Touting Achievements," Bloomberg, December 29, 2017, https://www.bloomberg.com/news/articles/2017-12-29/trump-stretches-meaning-of-deregulation-in-touting-achievements.

but also that clean energy will provide financial benefits.[34] The Clean Power Plan is a regulation that falls into Porter and van der Linde's philosophy that regulations cannot be assessed solely on their economics.

When the Obama administration passed Corporate Average Fuel Economy (CAFE) regulations in 2012, it argued that regulating an increase in fuel economy would provide significant economic and environmental benefits. On August 28, 2012, a White House press release proclaimed that CAFE regulations would save Americans approximately $1.7 trillion in gas, reduce carbon emissions by six billion metric tons, and significantly reduce foreign oil consumption by 2025. The touted benefits of CAFE regulations were not limited to the Obama administration. In 2011, 13 major car manufacturers supported CAFE's increase in fuel economy and the potential environmental benefits. The same press release asserted that these regulations would benefit automobile manufacturers by encouraging innovation and expanding research and development in advanced technologies. Technology is typically well ahead of regulations; however, CAFE regulations helped to disrupt standard business models and force the automotive industry to innovate for the good of the environment.[35] Car manufacturers and the Obama administration seemed to agree with Porter and van der Linde's theory that regulations, especially ones surrounding technology, enhance innovation, improve current technologies, facilitate industry progress, and increase competition by leveling the playing field.[36] The Obama White House also emphasized that these regulations are necessary to combat climate change by protecting air quality and reducing carbon pollution emitted from vehicles.[37] Estimates from the Obama administration suggest that global temperatures might drop with an increase in fuel economy to 54.5 mpg, reinforcing their claims about CAFE regulations. Research sponsored by the University of Central Florida and the Massachusetts Institute of

[34] Union of Concerned Scientists, "The Clean Power Plan," accessed February 19, 2018, https://www.ucsusa.org/our-work/global-warming/reduce-emissions/what-is-the-clean-power-plan.

[35] Bomey and Zambito, "Regulators Scramble to Stay Ahead of Self-Driving Cars."

[36] Porter and Van der Linde, "Environment-Competitiveness Relationship."

[37] White House, "Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards" (press release, Office of the Press Secretary, August 28, 2012), https://obamawhitehouse.archives.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard.

Technology showed that without CAFE, electric vehicles would have a 4 percent market share by 2030, but with CAFE and current electric vehicle incentive programs, the market share would increase to 30 percent by 2030, suggesting significant environmental benefits.[38]

The automotive industry is concerned that it will not be able to live up to the standards of CAFE regulations. In his article, Paul Eisenstein asserts they will force car prices to increase and subsequently eliminate American automotive jobs.[39] President Trump echoed the automotive industries' feelings on CAFE regulations when he stated, "My administration will work tirelessly to eliminate industry and job-killing regulations."[40] Eisenstein also explains that CAFE regulations are ineffective because, in recent years, oil prices have decreased, resulting in more Americans purchasing larger, less fuel-efficient vehicles. This has led to the unintended consequence of more trucks and SUVs being purchased despite their high cost and poor gas mileage.[41] Cass Sunstein of the University of Chicago argues that the essential aspect of regulations like CAFE, which may ultimately put American workers out of jobs, runs counter to American values.[42]

Some economists disagree with the Obama administration's expectations of CAFE regulations. While they agree that the intended benefits are good for the environment, some feel that the benefits are overstated. Professor Arthur van Benthem of the Wharton School at the University of Pennsylvania points to several key reasons why the benefits of CAFE may be overstated. First, he discusses the "rebound effect," which suggests that increased miles per gallon will cause people to drive their cars more than they normally would. Better mpg will lead to more driving, which in turn negates a portion of the anticipated benefits of CAFE. Next, he suggests that the demand for used cars will increase since new, higher

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[38] "Study Concludes US CAFE Regulation Can Accelerate EV Market Penetration," Green Car Congress, July 9, 2017, http://www.greencarcongress.com/2017/07/20170709-sen.html.

[39] Paul Eisenstein, "Trump Has Rolled Back Yet Another Key Part of Obama's Legacy," NBC News, March 16, 2017, https://www.nbcnews.com/business/autos/trump-rolls-back-obama-era-fuel-economy-standards-n734256.

[40] Eisenstein.

[41] Eisenstein.

[42] Cass Sunstein, "The Paralyzing Principle," *Regulation* (Winter 2002–2003): 32.

mpg cars will be more expensive. This added demand for used cars will increase atmospheric emissions.[43] Professor van Benthem claims that 92 percent of economists disagree with CAFE and would prefer increases in the gas tax and vehicle registration fees.[44] He argues that increasing the gas tax is better than regulations because improving the fuel efficiency of vehicles is good for the environment but making gas prices higher will likely reduce current driving levels.

According to the House Subcommittee on Coast Guard and Maritime Transportation, maritime security and economic regulations are essential to ensure safety and protect commerce on American waterways. However, this congressional subcommittee argues that the marine industry is facing unnecessary burdens due to safety and security regulations, which are stifling ocean commerce.[45] The U.S. economy depends on the maritime industry, a $100 billion industry that makes up almost 25 percent of the American gross domestic product.[46] The subcommittee has acknowledged that many current regulations are "blanket regulations" that offer little latitude to the maritime industry, resulting in increased expenses and a loss of American shipbuilding jobs.[47] The subcommittee recognizes that the maritime industry is currently facing more economic regulation than in past decades, leading to increased costs and a reduction in competition within the maritime economy.[48] While maritime regulations are still necessary, according to the subcommittee, reduced regulations would help alleviate the economic strain on the industry.

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[43] "The Unintended Consequences of Ambitious Fuel-Economy Standards," Wharton School, February 3, 2015, http://knowledge.wharton.upenn.edu/article/unintended-consequences-ambitious-fuel-economy-standards/.

[44] Wharton School, "The Unintended Consequences of Ambitious Fuel-Economy Standards."

[45] *Maritime Transportation Regulations: Impacts on Safety, Security, Jobs, and the Environment, Part 1: Hearing before the Subcommittee on Coast Guard and Maritime Transportation*, House, 113th Cong., 1st sess. September 10, 2013, https://www.gpo.gov/fdsys/pkg/CHRG-113hhrg82685/pdf/CHRG-113hhrg82685.pdf.

[46] *Maritime Transportation Regulations*.

[47] *Maritime Transportation Regulations*.

[48] *Maritime Transportation Regulations*.

Conversely, the government feels that in many cases, the healthcare industry—which should be a "safe place for patients to get quality medical care at an affordable price"—is not regulated enough.[49] According to Cathy Tokarski, hospitals need to make money to operate; they also have to provide information and quality care while avoiding price gouging. As evidence of the benefit of such regulations, Tokarski cites the push-back from hospitals regarding regulations to provide prospective patients data to make educated decisions based on price and quality of care. According to Tokarski, these regulations may drive up hospital costs, but the patients who receive treatment—sometimes lifesaving treatment—can make better decisions about their medical care, which leads to a higher percentage of successful treatments. [50] While these additional costs may have a negative impact on a hospital's bottom line, the government argues that the regulations are necessary for public safety.[51] The healthcare industry does a great job highlighting the regulatory debate. Each side supports its opinion with facts and data that best suit its argument.

By and large, regulations are designed to protect things such as the economy, safety and security of the nation, and health of American citizens. Regulations will always be debated, but according to Cora Roelofs and Michael Ellenbecker of the American Association for the Advancement of Science, "companies consistently complied with new regulations through innovative changes in production methods and products at less cost than the companies had originally estimated."[52] There are good and bad regulations, and ultimately, this debate will wage on over school bus security should regulations be enacted in that industry.

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[49] Cathy Tokarski, "Debating the Benefits of Regulation; Hospitals Say Regulations Drain Precious Resources; Government Officials Say They Ensure Safety. Both Agree New Laws Always Cost More Money," *Modern Healthcare*, August 20, 1990, http://www.lexisnexis.com.libproxy.nps.edu/lnacui2api/api/version1/getDocCui?lni=3SJF-SF60-0047-W278&csi=8291&hl=t&hv=t&hnsd=f&hns=t&hgn=t&oc=00240&perma=true.

[50] Tokarski.

[51] Tokarski.

[52] Cora R. Roelofs and Michael J. Ellenbecker, "Calculating the Benefits of Regulation," *Science* 300, no. 5624 (2003): 1372–1372.

B. BACKGROUND AND WORLD EVENTS

This section focuses on world events that have led to the current landscape for school bus security. Major terrorist attacks have struck the mass transit industry, and the school bus industry is the most extensive mass transportation system on a daily basis during the school year in the United States. While Americans have not witnessed a terrorist attack on a school bus, security incidents involving school buses are happening all over the world. These incidents identify potential flaws in the current school bus security system and highlight the need for possible strategies to mitigate further security incidents on American school buses.

1. Surface Transportation Security Regulation

The London and Madrid train bombings of 2004 and 2005 led to the creation of the TSA Surface Compliance Branch (SCB).[53] This portion of TSA was designed to provide oversight to an area of transportation that had virtually no security supervision. The creation of the SCB led to the implementation of a variety of voluntary security programs for stakeholders:

- Baseline Assessment for Security Enhancement (BASE)
- security action item reviews
- security incident response
- Visual Intermodal Prevention and Response (VIPR)[54]

Though they were created in 2005, some of these programs are still in existence and have been enhanced to serve surface transportation stakeholders better. These voluntary outreach programs were the genesis of the rail transportation security regulation

[53] Sonya Proctor and Robert Pryor, "Securing Our Surface Transportation Systems: Examining the Department of Homeland Security's Role in Surface Transportation Technologies," Transportation Security Administration, January 30, 2018, https://www.tsa.gov/news/testimony/2018/01/30/securing-our-surface-transportation-systems-examining-department-homeland.

[54] Department of Homeland Security, *Effectiveness of TSA's Surface Transportation Security Inspectors*, OIG-09-24 (Washington, DC: Office of Inspector General, February 2009), https://www.oig.dhs.gov/assets/Mgmt/OIG_09-24_Feb09.pdf.

(49 C.F.R. § 1580). This regulation was designed to ensure mass transit, passenger railroads, and freight railroads were reporting specific security events, maintaining designated security points of contact, and accounting for the location and chain of custody for certain rail cars containing toxic inhalation hazards (TIHs).[55] The rail transportation security regulation has been successful at reducing the amount of time TIH materials are left unattended and improved the railroad's accountability in knowing where they are at all times. The accomplishments of the federal security regulations in the railroad industry suggest that similar successes and security enhancements are obtainable for the school bus transportation industry. Expanding rules into this industry would bring uniformity and a set of minimum standards as well as help create an environment capable of responding and preventing specific security incidents.

2. Domestic Incidents

Attacks against American school buses have not been prevalent; however, the threats to these conveyances are real as evidenced by some recent events, both domestically and abroad. In 2004, it was reported that the U.S. military had discovered American school information in terrorist hideouts. The FBI notified school districts that individuals in six states had obtained photographs and school security plans, and the Department of Education alerted school districts that school facilities might be terrorist targets.[56]

In 2013, Dale County, Alabama, school bus driver Charles Poland was shot and killed after he refused to let a gunman, Jimmy Lee Dykes, kidnap the children on his school bus.[57] After taking four bullets, Poland was able to fight Dykes off long enough to allow 21 students to escape from the school bus, and only one five-year-old boy was taken hostage.[58] According to Mark Memmott of National Public Radio, while Poland's heroic act on the school bus did not prevent the kidnapping of one child, it likely made the rescue

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[55] Rail Transportation Security, 49 C.F.R. 1580 (2010).

[56] Pete Baxter, Charles Gauthier, and John Green, "Addressing Security Risks in School Transportation," *TR News* 237 (March–April 2005): 26–27.

[57] Bothelo, "Slain Alabama Bus Driver Called a Hero."

[58] Stephen Silverman, "Slain School Bus Driver Hailed as Hero after Gunman Demanded Students," *People*, January 31, 2013, https://people.com/crime/school-bus-driver-charles-poland-hailed-as-hero/.

effort easier for law enforcement officials.[59] Memmott's article details how law enforcement officers, after almost a week-long standoff, were able to distract Dykes, storm his bunker, kill him, and rescue the five-year-old hostage. Poland had reacted instinctually, displaying courage in a last attempt to provide security to the students aboard his school bus.

In a similar situation on May 26, 2018, as reported by the Associated Press (AP), a Campo, California, man, Matthew Barker, charged onto a school bus and held a knife to the driver's throat.[60] The reason behind his actions was not immediately known, but according to the AP, children on the bus, parents, and bystanders facilitated an evacuation effort and subdued Barker before anyone was injured. As a sixth grader led children out of the emergency exit, adults rushed the bus and wrestled the knife away. This incident demonstrates the importance of partnerships and community engagement regarding school bus security. The students and parents each actively engaged in protecting the school bus and the children on board. The evacuation tactics that the sixth grader used is something that can be taught to all students, so they are prepared to respond in a similar situation. Securing school buses across the country is a big task that requires the help and vigilance of entire communities.

CBS News reports an incident involving a Massachusetts man who stopped a school bus in the middle of the Massachusetts Turnpike, on May 2, 2018, because he thought the windows of the school bus were too dark.[61] The article provides school bus driver Joe Rizoli's account of how he utilized a dashboard camera to capture the man's photo and license plate number while ensuring the man, who broke numerous traffic laws and seemed unstable, was unable to gain access to the school bus. Additionally, it was

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[59] Mark Memmott, "Dramatic End to Alabama Hostage Standoff Took Careful Planning," NPR, February 5, 2013, https://www.npr.org/sections/thetwo-way/2013/02/05/171141408/dramatic-end-to-alabama-hostage-standoff-took-careful-planning.

[60] Associated Press, "Man Barges onto School Bus, Holds Knife to Driver," U.S. News, May 20, 2018, https://www.usnews.com/news/best-states/california/articles/2018-05-26/man-barges-onto-school-bus-holds-knife-to-driver.

[61] CBS News, "Video Captures Man Jumping on School Bus in Middle of Massachusetts Turnpike," May 4, 2018, https://www.cbsnews.com/news/massachusetts-turnpike-video-captures-man-jumping-on-school-bus/.

reported that Rizoli used his personal dashboard camera, suggesting that the Weston Public School bus was not equipped with an exterior monitoring system. Although there were no students on the bus at the time of this incident, the use of the dashboard camera suggests that such a technology can benefit security. Rizoli took the initiative by using his own resources to provide an additional layer of safety and security for the children on his school bus. The proactive use of this device led to the identification of the individual, whose name was not released by police, resulting in several criminal charges and the possibility of license revocation.[62]

Similarly, a mother from Glendale, Wisconsin, attacked a school bus with a hammer after receiving a phone call from her daughter regarding a fight she had on the school bus, according to Colleen Henry of ABC's Wisconsin affiliate.[63] Henry's report chronicles how the angry mother attempted to cut off the bus and then smashed a window with a hammer after the bus driver, who radioed her dispatch center for help, refused to let her onto the bus to get her daughter. The driver's actions illustrate the importance of domain and security awareness when it comes to protecting the children from a potential security incident.

Previously, in Leominster, Massachusetts, a convicted felon, Ricardo Morales, attacked a school bus with a metal pipe and machete because he was angry that the school bus was picking up children in front of his driveway, according to Cliff Clark of the *Sentinel & Enterprise* newspaper in Fitchburg.[64] This incident also highlights the importance of awareness and vigilance in school bus security. Strategies for observing suspicious activity and behavior, as well as responses to these situations, can be presented to school bus employees through security training programs. While some individuals may naturally react appropriately during a security incident, such as the bus drivers in the

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[62] Marc Fortier and Jake Levin, "Man Who Jumped on Hood of School Bus on Mass. Pike Charged," NBC Connecticut, May 4, 2018, http://www.nbcconnecticut.com/news/national-international/Man-Who-Jumped-on-Hood-of-School-Bus--481751251.html.

[63] Colleen Henry, "Angry Parent Attacks School Bus with Hammer, Driver Says," WISN, June 13, 2018, http://www.wisn.com/article/angry-parent-attacks-school-bus-with-hammer-driver-says/21291893.

[64] Cliff Clark, "Leominster Man Charged with Striking School Bus with Pipe and Machete," *Sentinel & Enterprise News*, September 28, 2017, http://www.sentinelandenterprise.com/news/ci_31337687/leominster-man-charged-striking-school-bus-pipe-and.

Wisconsin and Massachusetts cases, instituting security training programs may help facilitate appropriate responses throughout their organizations when the security of school bus passengers is threatened.

The Chowchilla, California, kidnapping case in 1976, the largest mass kidnapping in U.S. history, is a not-so-recent incident that highlights how threats to school buses have evolved over time. Three individuals kidnapped a school bus full of 26 children and the driver—forcing them underground into a box truck that had been buried at the family quarry of one of the kidnappers—while they tried to collect a $5 million ransom.[65] Led by their bus driver, Edward Ray, all 27 individuals were able to escape to safety, and the individuals behind this kidnapping were arrested and given long prison sentences.[66] While these incidents were not labeled terrorist attacks, they do emphasize that school buses are a very soft target that could be exploited by common criminals, terrorist groups, or homegrown violent extremists.

The closest thing to a terrorist attack against a school bus in the United States happened on October 31, 2017, when Sayfullo Saipov, inspired by the Islamic State of Iraq and Syria, killed eight people near the World Trade Center by driving a rental truck through a bike path.[67] The attack culminated in Saipov crashing his vehicle into a school bus, trapping several students on board.[68] While Saipov's attack did not center around the school bus, this assault exhibits the vehicle ramming threat that faces pedestrians and soft targets like school buses. Defending against vehicle ramming attacks is extremely difficult, but as the threat persists, training opportunities for mitigation and response strategies have presented themselves.

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[65] Dan Noyes, "Chowchilla School Bus Kidnap Victims File Lawsuit," ABC 30 Fresno, March 25, 2016, http://abc30.com/1262680/.

[66] Holly Yan, "Buried Alive: California Mass Kidnapping Victims," CNN, December 28, 2015, https://www.cnn.com/2015/11/19/us/rewind-chowchilla-school-bus-kidnapping/index.html.

[67] Shimon Prokupecz, Eric Levenson, and Brynn Gingras, "ISIS Note Found Near Truck Used in Manhattan Terror Attack, Source Says," CNN, November 6, 2017, https://www.cnn.com/2017/10/31/us/new-york-shots-fired/index.html.

[68] Jose A. Del Real and Corey Kilgannon, "Mangled School Bus, Bodies Everywhere in Manhattan; 'It Was Surreal,'" *New York Times*, October 31, 2017, https://www.nytimes.com/2017/10/31/nyregion/nyc-scene-terror-attack-truck-witnesses.html.

3. International Incidents

The United States is not alone in threats and security incidents involving school buses. School buses have been the target of attacks in other countries, and in some cases, these attacks have led to policy changes, especially in Israel. On May 24, 1970, the Popular Front for the Liberation of Palestine (PFLP) ambushed an Israeli school bus, firing four bazooka rounds into the bus traveling near the Lebanese border in Avivim, killing 12 people including eight children.[69] This attack helped to shape current school and busing security policies throughout Israel.

Security measures are unlikely to prevent airstrikes against school buses, as shown in another case in Yemen. According to Shuaib Almosawa and Ben Hubbard of the *New York Times*, on August 9, 2018, a Saudi-led airstrike in Yemen hit a school bus, killing at least 43 individuals, including 29 children, and injuring more than 60 people.[70] Almosawa and Hubbard report that the Saudi-led coalition deemed this a "legitimate military operation," necessary to suppress the Houthi rebels in the Yemeni civil war. The Saudis have contended that the targeting of this school bus was in retaliation to a previous Houthi attack on Saudi civilians in Jizan, Saudi Arabia.[71] Even as the Saudis claim the bus was transporting terrorists, the United Nations Security Council and Yemeni civilians have condemned the attack.[72] This incident in Yemen highlights the potential for terrorists to use school buses as a concealment method. Even if terrorists were being transported on the school bus and using innocent children as shields, the Saudi coalition could not win—as the optics of dead children and a blown-up school bus transcend military operations.

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[69] "All Israel Shares in the Anguish of the Families Whose Children Were Killed in Ambush," *Jewish Telegraphic Agency Daily News Bulletin*, May 25, 1970, xxxvii, https://www.jta.org/1970/05/25/archive/all-israel-shares-in-the-anguish-of-the-families-whose-children-were-killed-in-ambush.

[70] Shuaib Almosawa and Ben Hubbard, "Saudi Coalition Airstrike Hits School Bus in Yemen, Killing Dozens," *New York Times*, August 9, 2018, https://www.nytimes.com/2018/08/09/world/middleeast/yemen-airstrike-school-bus-children.html.

[71] Richard Roth and Zachary Cohen, "UN Security Council Calls for Probe into Saudi-Led Airstrike on Yemen School Bus," CNN, August 10, 2018, https://www.cnn.com/2018/08/10/politics/un-security-council-investigation-saudi-yemen-strike/index.html.

[72] Stephen Synder, "Civilians Say 'Time to Say No for War' after Dozens of Yemeni Children Die in School Bus Attack," Public Radio International, August 11, 2018, https://www.pri.org/stories/2018-08-11/civilians-say-time-say-no-war-after-dozens-yemeni-children-die-school-bus-attack.

A 2011 Hamas missile attack on an Israeli school bus led to the deaths of five students and demonstrated that even children are not off limits in that ongoing battle.[73] The attacks and threats to school buses in Israel, India, and Pakistan unequivocally display the real threat facing school buses. Unfortunately, there is not much that can be done to stop a missile or rocket attack against a school bus. It is likely that hoping for a miss is the best strategy to combat this style of attack. However, that should not preclude school bus agencies in America and all over the world from training their personnel on the legitimate threats that they face.

In January 2018, a group of protesters attacked a school bus full of children by throwing rocks at it in Gurgaon India.[74] The protesters were upset over the film *Padmaavat*, which allegedly depicted an intimate relationship between a Muslim king and Hindu queen.[75] In this case, the school bus was in the wrong place at the wrong time rather than the object of a coordinated attack. In this regard, it bears similarities to the school bus vehicle ramming in New York City. While this particular bus was not sought out, it ended up directly involved in a security incident. When such events happen, the hope is that the school bus driver is ready and will respond appropriately to the event.

Sam Rkaina of Mirror Online writes that Pakistani officials issued warnings in late 2014 that the Taliban was threatening to explode occupied school buses using magnetic bombs affixed underneath the chassis.[76] Rkaina reports that the Islamabad police force had urged bus officials to increase the use of under-vehicle security inspections. This tactic illustrates the importance of school bus security inspections, which will require formalized training of school bus drivers, so they become familiar with potential suspicious activity and devices on and around their buses. While this type of attack has yet to be carried out

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[73] Kershner, "Missile from Gaza Hits School Bus."

[74] Deepshikha Ghosh, "Horror on a School Bus in Gurgaon, Attacked by Mob Protesting 'Padmaavat,'" NDTV, January 25, 2018, https://www.ndtv.com/gurgaon-news/horror-on-a-school-bus-near-delhi-attacked-by-mob-protesting-padmaavat-1804295.

[75] "Why a Bollywood Epic Has Sparked Protests," BBC, January 25, 2018, https://www.bbc.co.uk/news/world-asia-india-42048512.

[76] Sam Rkaina, "Pakistan School Attack: Warning as Terrorists 'Threaten to Put Magnetic Bombs under School Buses,'" Mirror, December 17, 2014, https://www.mirror.co.uk/news/world-news/pakistan-school-attack-warning-terrorists-4827580.

by the Taliban, it had to be taken seriously since, just days before this threat was issued, the Taliban killed 132 students at a Pakistani military-run high school.[77]

C. CONCLUSION

Understanding the threat may provide enough knowledge and vigilance to allow a bus driver to plan to steer away from some hostile regions, which may be enough to avoid an attack. The rock-throwing incident in India and the magnetic bomb threats in Pakistan are situations in which training and appropriate security inspections could mitigate risks. Security incidents are going to happen, as evidenced by the cases throughout the world, but with the proper regulations, policies, procedures, training, and implementation strategies in place, many of them can be proactively mitigated. Threats are always evolving, and it is unlikely that transportation systems can minimize every vulnerability they face. However, with the implementation of mitigation strategies, such as training, outreach, partnerships, physical security measures, and security inspections, school bus organizations can be better prepared to employ proactive security measures and effective response techniques. Chapter III addresses security strategies from the international community to help combat some of the aforementioned security incidents.

[77] Jibran Ahmad and Zahra-Malik, "Taliban Go on Killing Spree at Pakistan School, 132 Students Dead," Reuters, December 16, 2014, https://www.reuters.com/article/us-pakistan-school/gunmen-hold-500-students-hostage-in-pakistani-city-of-peshawar-idUSKBN0JU0JO20141216.

III. CURRENT PRACTICES: SCHOOL BUS SECURITY THROUGHOUT THE WORLD

The school bus transportation system in the United States is relatively unique compared to the rest of the world. While school buses exist in other countries, they are not as prevalent. While the scale and use of the U.S. school bus transportation system may not be matched anywhere else in the world, the United States should consider replicating certain practices from other countries to enhance security on school buses.

A. INTERNATIONAL PRACTICES

Israeli laws that govern school security require mobile protection of students during school trips or extracurricular activities. According to a writer for News Rep, Israeli students travel to these events on chartered buses while being escorted by armed guards in a vehicle following closely behind.[78] Generally, these escort teams consist of former Israel Defense Forces (IDF) soldiers, armed with high-powered rifles, and a combat medic. Lastly, according to News Rep, these teams not only are responsible for providing security to the students but also are required to have discussed potential evacuation plans with the students and faculty if the group needs to end its trip abruptly. Israeli school security and mobile protection policies stem from a 1974 Palestinian terrorist attack on an Israeli elementary school.[79] Israel's implementation of these policies has virtually eliminated attacks on schools or school transports.

Since school buses as Americans know them do not exist in Israel, most Israeli students take public transportation to school. While not explicitly designed to enhance school security, IDF occupies the majority of public transportation buses throughout Israel.[80] With students riding these buses each morning and afternoon, the presence of IDF

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[78] Eli, "School Security in Israel," News Rep, February 25, 2018, https://sofrep.com/100108/school-security-in-israel/.

[79] "Should America Embrace Israel's School Safety Model?" Jewish Voice Ministries International, February 23, 2018, https://www.jewishvoice.org/read/blog/should-america-embrace-israels-school-safety-model.

[80] Raoul Wootliff, "IDF Troops Boost Security on Jerusalem Buses," *Times of Israel*, October 18, 2015, https://www.timesofisrael.com/idf-troops-boost-security-on-jerusalem-buses-train/.

on these buses adds a layer of security for students during their commute. In Israel, the presence of armed security guards on buses offers a physical deterrent and places a "good guy" with a gun in a position to quickly respond to a threat. While these guards are no match for implanted explosive devices or rockets fired at buses, as previously discussed, they offer a level of security that is typically unavailable to passengers, including students on school buses, throughout the rest of the world.

Surveillance cameras are becoming commonplace on American school buses but still fall well below 100 percent implementation. Ismail Sebugwaawo of the *Khaleej Times* writes that beginning in 2011, the city of Abu Dhabi passed legislation requiring all schools to equip their buses with closed-circuit television (CCTV) cameras.[81] Sebugwaawo reveals that recently, an Abu Dhabi private school that failed to comply with these regulations was found negligent for not having installed the proper CCTV equipment and fined $27,226. The school had been unable to provide parents with footage of their child being attacked on the bus. This incident demonstrates the value security regulations offer to students who ride school buses.

Successful safety and security programs for public transportation systems require participation from the transportation stakeholder, government and elected officials, and the public. Ramona Ruiz of *The National* in the United Arab Emirates (UAE) details that along with the requisite onboard CCTV systems, Emirates Transport requires motion sensors, check buttons, and outreach engagement with parents, teachers, and students to educate them on implementation strategies to improve safety on school buses.[82] Ruiz's article addresses inspections, student behavior codes, maintenance protocols, and student checking systems. Emirates Transport also uses a robust safety training program for its drivers and bus supervisors.[83] These programs have concentrated on some of the largest

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[81] Ismail Sebugwaawo, "Abu Dhabi School Fined $27,226 for Not Fitting CCTV Cameras in School Bus," Zawya, February 3, 2018, https://www.zawya.com/mena/en/story/Abu_Dhabi_school_fined_27226_for_not_fitting_CCTV_cameras_in_school_bus-SNG_109026904/.

[82] Ramona Ruiz, "School Bus Safety Should Be Taught at Home, UAE Experts Say," *The National*, November 7, 2015, https://www.thenational.ae/uae/transport/school-bus-safety-should-be-taught-at-home-uae-experts-say-1.40952.

[83] "Public Schools Transport Services," Emirates Transport, accessed June 7, 2018, https://www.et.gov.ae/Pages/OurServices/SchoolTransports/Publicschools.aspx.

cities in the UAE such as Abu Dhabi, Dubai, and Sharjah. The fact that Emirates Transport has been able to implement these programs in such large cities suggests that it would be feasible to implement similar security-focused programs in municipalities throughout the world, especially within the United States. While Emirates Transport has focused its outreach, training programs, and inspections on safety, these programs could transition into more security-centric training, outreach, and inspection programs with the right policy adaptations.

Staying in the Middle East, the Supreme Education Council of Qatar solicited the RAND Corporation for advice on how to improve the safety and security of its school transportation system. The Qatari government recognized that school transportation was a problem in its country and took a proactive approach to address the issue. An important observation from RAND's 2012 report was that its recommendations to the Qatari government were based on "international norms," which also apply to the U.S. context.[84] These recommendations focused on universal licensing and training requirements for drivers, standardized pre- and post-trip inspection checklists, homogenous policy manuals, and security awareness campaigns for the public and school transportation employees.[85] Implementing these suggestions, via regulations, throughout the country of Qatar would establish a security baseline for all school transportation agencies to follow. Once it establishes that baseline, the Supreme Education Council of Qatar will be able to enforce these standards, much like in Abu Dhabi, to provide the safety and security it sought when it collaborated with RAND.

Turkish authorities have also initiated a security training program for their school bus drivers. The *Hurriyet Daily News* reports that school bus drivers must undergo security training focused on bus inspections, provide a certificate of training completion as well as a health report to the education ministry, and face additional scrutiny if they have

[84] Obaid Younossi et al., "Qatar's School Transportation System: Supporting Safety, Efficiency, and Service Quality," *Qatar Foundation Annual Research Forum Proceedings* (October 2012): 2, https://doi.org/10.5339/qfarf.2012.AHP27.

[85] Younossi et al.

previously been under any form of investigation.[86] The report asserts that these actions are in response to several violent incidents that have taken place near school buses. Ideally, these measures, especially the security training programs, would be implemented proactively to prevent attacks or security incidents from taking place in the first place. Recognizing the threat and the unacceptability of putting children in danger while they transit to and from school, the Turkish government instituted policies and programs to increase the security knowledge and vigilance of its drivers.

Outside the United States, India offers a relatively large-scale school bus transportation system that has a variety of security, safety, and appearance requirements. The Indian government, led by the Central Board of Secondary Education (CBSE) and the Supreme Court, has mandated many features similar to those of American school buses. The Track School Bus website provides a detailed outline of the expectations for school bus companies, schools, buses, drivers, students, and parents. According to the website, all Indian school buses must be yellow; have reliable locks on all doors, a global positioning system that is capable of tracking the bus at all times, CCTV with a minimum 60-day recording capability, which is submitted to the police for investigations; and be equipped with sensor technology that prohibits the bus from moving when one of the doors is open.[87]

The aforementioned website also points out that drivers must obtain a transport license for light motor vehicles to operate a bus and should have only limited interaction with the children on the bus. Restricting interaction with students is an interesting philosophy—as part of security in this environment should be developing relationships. In doing so, the driver has a better chance of recognizing behavior that deviates from a child's norm. However, the benefit of limiting this interaction could be that drivers do not become overly friendly with the children, which may cause complacency, which could also lead to missed or overlooked deviations in normal behavior and routine. Additionally, limiting interactions to boarding and unloading times, for example, might make drivers more

[86] "Turkish Gov't Announces New Measures for Security on School Buses," *Hurriyet Daily News*, October 24, 2017, http://www.hurriyetdailynews.com/turkish-govt-announces-new-measures-for-security-on-school-buses-121331.

[87] "India," Track School Bus, December 11, 2014, https://www.trackschoolbus.com/school-bus-rules-and-regulations/india/.

observant of their surroundings and improve their ability to drive safely and recognize suspicious or anomalous behavior on the road or at upcoming bus stops. Not only are Indian school bus drivers required to limit their interactions with students; they are also mandated to maintain a list containing the names, addresses, blood types, bus routes, bus stops, and social classes of all students on their buses.[88] Furthermore, as Track School Bus points out, all parents are issued identification cards, which they must display when retrieving their children from the school bus. Should another adult need to pick up a student, the parents must make arrangements prior to their child riding the bus that day. Lastly, the Indian government demands restricted access to school grounds to provide further security to students as they arrive and depart on the school bus. Many of these policies and security tools seem like common sense, but they are not performed everywhere. In some cases, these regulations may be hard to follow, especially if no one is watching, but the Indian government is taking a proactive security approach when it comes to protecting its children while in transit to and from school.

Compliance with security regulations is paramount in ensuring the security of the children on board Indian school buses. This compliance protects not only children but also—from an economic standpoint—transportation entities from fines and civil penalties. Physical security measures on Indian buses are vital but are just the tip of the iceberg when it comes to a complete security program. An article in the *Indian Express* also discusses the importance of behind-the-scenes security measures. The article explains that each bus company must employ a well-trained transport manager and a "lady attendant" for each bus.[89] These positions appear to be similar to rail security coordinators (RSCs) and alternate RSCs in the United States. RSCs and alternate RSCs are required, by federal regulation, to be the points of contact for all railroad security matters including incident management, incident and suspicious activity reporting, data for federal inspectors, and compliance inspections.[90] These individuals work directly with Transportation Security

[88] Track School Bus, "India."

[89] "CBSE Increases Students' Security, Makes CCTVs, GPS Mandatory in School Buses," *Indian Express*, February 24, 2017, http://indianexpress.com/article/education/4542105cbse-increases-students-security-makes-cctvs-gps-mandatory-in-school-buses/.

[90] Transportation Security Administration, "Rail Transportation Security."

Administration (TSA) inspectors to ensure all security regulations are followed, certain freight commodities are monitored, and passenger trains are secured. When railroads fail to meet these regulations, they could face civil monetary penalties. India's transport managers and heads of schools can also be held liable, and their affiliations with the schools and school buses could be revoked if the proper security actions are not incorporated.[91] Revoking an affiliation in India, much like issuing a civil penalty to an American railroad, directly affects a company's profit margin. While security is critical to transportation companies, especially school bus entities, their overall goal is still to make money. Losing money or the ability to make money makes operating a profitable business challenging. If India can enforce these regulations effectively, the school bus agencies will comply to avoid penalties, which may reduce their profits.

Having strategies to enforce regulations in India does not necessarily lead to compliance. Joy Sengupta from the *Times of India* reports that transportation in Pune, India, is not receiving the necessary support from the police and school officials when it comes to school bus security.[92] Pune officials have looked to schools and the police to enforce the law against transit agencies that provide insufficient security on buses or inadequate security training to drivers and transportation managers. Holding agencies that have neglected their security responsibilities accountable, both publicly or privately, reiterates the importance of security and demonstrates a commitment to the protection of children. Sengupta states that regional transport officials in Pune will initiate legal action to end this negligence.[93] This article demonstrates the challenges that school bus security can face. In some cases, school officials are unfamiliar with appropriate methods for securing buses. A lack of police support may follow from complacency directed at school bus security, other law enforcement responsibilities, or a prioritizing of more important criminal matters.

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[91] "CBSE Increases Students' Security."

[92] Joy Sengupta, "RTO Rues Lack of Cop Support to School Bus Security Checks," *Times of India*, May 29, 2018, https://timesofindia.indiatimes.com/city/pune/rto-rues-lack-of-cop-support-to-school-bus-security-checks/articleshow/64360526.cms.

[93] Sengupta.

Some Indian school bus companies are guilty of lax security practices on buses. The *Times of India* published an article in 2016 detailing the sexual assault of a kindergarten student on a Gurgaon school bus.[94] According to the article, Gurgaon transportation services cost parents 2,000–6,000 rupees ($29.55–$88.64 USD) each month. While the cost in American dollars may seem negligible, it is indeed more than any parent wants to pay for their child's safety and security to be in jeopardy. Incidents like this have forced parents to remove their children from school bus transportation and seek alternate arrangements—for example, private transportation services—which may be more expensive, or make their kids walk a long distance to school.[95]

Even with the scenarios in Pune and Gurgaon, the fact that India is mandating security regulations and technology for their school buses is a positive step in protecting children. Not every policy or oversight agency is perfect, but India's security strategy encourages proactive security behavior and sets a precedent. Over time, specific security measures become culturally accepted. Americans may not always like the airport security procedures that TSA employs, but by and large, they have grown to understand the importance of the security procedures and the potential consequences if certain security processes returned to their pre-9/11 form. If India continues to push its school bus security agenda, it too will become rooted in its culture, and Indian children will be all the better for it.

Economically, China is experiencing much growth and is seen as a world leader. However, concerning school bus security, China considers itself a neophyte and is actively researching the security policies and procedures countries such as India, the UAE, and the United States have in place. China is seeking to enhance security within its school transportation system. In a recent World Bank article, Chinese senior transport specialist Fei Deng highlights China's current school transport safety and security issues.[96] Fei

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[94] "'Hefty Transportation Charges, but Lax Security on School Buses,'" *Times of India*, August 13, 2016, https://timesofindia.indiatimes.com/city/gurgaon/Hefty-transportation-charges-but-lax-security-on-school-buses/articleshow/53677669.cms.

[95] "'Hefty Transportation Charges.'"

[96] Fei Deng, "On the Road to Safe School Transport in China," World Bank, accessed May 30, 2018, http://www.worldbank.org/en/topic/transport/publication/on-the-road-to-safe-school-transport-in-china.

explains that China is trying to upgrade its school transport system by emulating countries, such as the United States, with established school bus transportation systems including safety and security aspects. Chinese research, according to Fei, is working toward the development of standardized bus maintenance programs, laws governing buses and drivers, and heightened public awareness. The World Bank article concludes that the best way for this advancement in safety and security on Chinese school buses should come from the creation of one national oversight body and law enforcement organizations that enforce whatever safety and security laws the Chinese government passes. While China may not have a sufficient school bus security strategy, the country understands that one is necessary to protect its students. Establishing a uniform policy throughout the country, by borrowing strategies from established programs and methods, is something that other countries around the world should be doing to mitigate security vulnerabilities on school transport systems.

Ultimately, the goal of school bus transportation is to safely and securely transport children to and from school. Throughout the world, the method of achieving this goal looks very different regarding security processes and transportation conveyances. Australia provides school bus services only to individuals who live a certain distance from their schools.[97] Old vans, in desperate need of replacement, are used India, Malaysia, and Morroco, according to Mark Abadi of *Business Insider*.[98] Abadi notes that many countries, such as Kenya and Cuba, receive old school buses or transit buses from other countries and repurpose them. Cuba receives school buses from Canada, but they are used only for public transportation. Japan turns its school buses into mobile Pikachus, and Germany uses Mercedes-Benz buses.[99] School buses in other countries have much more dangerous terrain to navigate. In Vietnam, buses must traverse flooded roadways during the monsoon season, and privately owned Libyan school buses potentially have to navigate through terrorist neighborhoods and strongholds.[100]

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[97] "School Student Transport Scheme," Neville's Bus Service, accessed May 30, 2018, https://busaboutwagga.com.au/schoolfreetravel.html#SSTS.

[98] Mark Abadi, "What School Buses Look Like in 12 Countries around the World," *Business Insider*, May 25, 2018, http://www.businessinsider.com/school-buses-around-the-world-2018-5.

[99] Abadi.

[100] Abadi.

B. AMERICAN PRACTICES

Keeping children safe on the school bus has and will always be a huge priority for school bus companies and school districts. Common concerns on the school bus include student behavioral issues and discipline from school bus incidents.[101] For example, school bus discipline reports from the Baltimore, Maryland, area detail numerous incidents involving violence, drugs, and sex on board city school buses.[102] School bus companies and school districts are starting to understand that these "common concerns" seen on their school buses are just the beginning. This change in philosophy is leading to "school transportation officials . . . increasingly learning that school bus security and emergency planning is as . . . important as school security and crisis planning in the actual school buildings."[103] As detailed earlier, Charles Poland died a hero protecting the children on his school bus.[104] This act of bravery increased the level of discussion about school bus security, not only in Alabama but across the country as well.[105] In Alabama alone, this incident caused several changes: trespassing on a school bus is now a Class A misdemeanor, which raises the punishment up to a $6,000 fine and possible jail time; no trespassing signs were posted on all school buses, and Dale County increased its partnerships with law enforcement to enhance school bus security.[106] Throughout the country, discussions are taking place about school bus security adaptations such as physical features, technology, training programs, driver background checks, security assessments, and law enforcement partnerships.[107] These security conversations offer opportunities to develop strategies to mitigate potential threats to school buses.

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[101] "School Bus Transportation Security," National School Safety and Security Services, accessed August 7, 2017, http://www.schoolsecurity.org/resource/school-bus-security/.

[102] Joce Sterman, "School Bus Discipline Reports Show Shocking Behavior," WMAR, February 4, 2014, https://www.wmar2news.com/news/local-news/investigations/school-bus-discipline-reports-show-shocking-behavior.

[103] National School Safety and Security Services, "School Bus Transportation Security."

[104] Bothelo, "Slain Alabama Bus Driver Called a Hero."

[105] Blue, "Keep Security on the Front Burner."

[106] Blue.

[107] Blue; and National School Safety and Security Services, "School Bus Transportation Security."

1. Bus Drivers

Our children's safety and security are in the hands of the school bus driver while they are in transit to and from school. According to CBS News, on average, 60 school bus drivers get into traffic accidents each day; however, that is the least of our concerns, as once per week, a school bus driver is arrested for driving under the influence (DUI), child pornography, or sexual assault.[108] Reports like these suggest that the background check process for school bus drivers is not as extensive as it needs to be.

School bus drivers are required to obtain a commercial driver's license (CDL), but because the majority of them do not cross state lines, certain federal regulations do not apply regarding the standards they must meet to hold a CDL.[109] In an article by Kris van Cleave and Megan Towey for CBS News, transportation attorney Steve Gursten explains that there are no universal standards for disqualifying school bus drivers—even if a potential driver has a criminal record or a history of DUIs.[110] He also states, "Truck drivers that are driving heads of lettuce or television sets actually have to meet higher safety standards than the people that drive our children on school buses."[111] Van Cleave and Towey further suggest that many states do not know what types of offenses their school bus drivers have committed. Twenty-two states claimed their school bus drivers did not have a DUI in the last three years, but CBS uncovered that each of those states had at least one instance of a school bus driver being arrested for DUI. Moreover, Maryland and Connecticut were the only two states that kept a record of school bus driver on-the-job arrests.[112] These discrepancies in records reveal that more thorough reviews of license applications, which search for disqualifying factors, need to be conducted.

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[108] Kris van Cleave and Megan Towey, "CBS News Investigation Finds Stunning Lack of Oversight of School Bus Drivers," CBS News, June 27, 2017, https://www.cbsnews.com/news/stunning-lack-of-oversight-for-school-bus-drivers-cbs-news-investigation/.

[109] Van Cleave and Towey.

[110] Van Cleave and Towey.

[111] Van Cleave and Towey.

[112] Van Cleave and Towey.

The lack of uniformity for disqualifying factors suggests that federal legislation may be necessary to ensure that school bus drivers throughout the United States are all held to the same standards. To provide this uniformity, former Massachusetts governor Deval Patrick signed a bill requiring that all school employees, including bus drivers, submit to a state and federal fingerprint-supported criminal record check whereby education officials can access the results.[113] Having access to these results can lead to more informed decisions when it comes to hiring bus drivers. Similar policies have been enacted in Knox County, Tennessee.[114] Senator David Vitter of Louisiana also tried to do this on a national level when he introduced the Safety of Our School Children Act in January 2015.[115] If passed, this act would require school districts to conduct an FBI background check on all potential school bus drivers and utilize the National Driver Registry and state CDL information system.[116]

Some school districts are reporting an approximate 90 percent shortage of bus drivers, according to *Hire Right*.[117] Due to this shortage, some school districts have resorted to social media and even Craigslist to recruit potential drivers.[118] School districts have acknowledged their failure and are trying to correct the issue. After firing a driver that had warrants due to unpaid vehicular tickets, Dallas County Schools (DCS) recognized that its background check process was lacking. Its background check procedures called for a review of a school bus operator's driving records twice per year; however, these checks did not search for warrants among the Texas Department of Public Safety's motor vehicle

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[113] "New Law Requires National Background Check for Teachers," *MetroWest Daily News*, January 11, 2013, https://www.metrowestdailynews.com/article/20130111/NEWS/301119811.

[114] Michael Klazema, "Knox County Schools Toughens Bus Driver Background Checks," *Background Checks* (blog), July 31, 2017, http://www.backgroundchecks.com/community/Post/4853/Knox-County-Schools-Toughens-Bus-Driver-Background-Checks.

[115] Safety for Our Schoolchildren Act of 2015, S. 63, 114th Cong., 1st sess. (2015), https://www.congress.gov/bill/114th-congress/senate-bill/63.

[116] Ryan Gray, "Federal Legislation Targets School Bus Driver Backgrounds," School Transportation News, January 29, 2015, http://stnonline.com/news/latest-news/item/6522-federal-legislation-targets-school-bus-driver-backgrounds.

[117] "Keeping Our Children Safe: The Vital Need to Conduct and Enforce Background Checks for School Bus Drivers," *Hire Right* (blog), June 30, 2017, http://www.hireright.com/blog/2017/06/keeping-children-safe-vital-need-conduct-enforce-background-checks-school-bus-drivers/#sthash.NlXtvlRE.dpbs.

[118] Van Cleave and Towey, "Stunning Lack of Oversight of School Bus Drivers."

reports.[119] DCS had a policy in place to check on its drivers, but it lacked depth and implementation. Annual audits of safety and security policies offer the potential to identify gaps such as the one DCS faced and correct the problem before it poses a risk. If the individuals who are transporting school children are not properly vetted, all of the other security features that a school bus company or school district has implemented will be for naught.

Enhancing homeland security through increased school bus security is not something that happens overnight, and it is not without concerns. The National Association of Pupil Transportation Services (NAPTS) is concerned about bus drivers being arrested, regardless of the offense. However, the association has expressed concerns over CBS's report of the lack of bus driver oversight and suggested that the media are exaggerating the oversight problem.[120] NAPTS executive director Charlie Hood cites that the 10,000 school bus drivers arrested each year equate to .01 percent of the entire population.[121] Hood also references the fact that school bus operators are subject to 37 federal motor vehicle safety standards, and some agencies even conduct random field DUI checks of their drivers.[122] The comments from Hood and the NAPTS suggest that they believe the school bus industry is being unfairly characterized as having a criminality problem among their bus drivers. While the statistics seem to bear that very few drivers are acting inappropriately, the bad publicity of any driver arrest and the perception that follows may be enough to increase the pressure to institute more stringent hiring and background check policies for bus drivers.

Other concerns exist with increased and more streamlined background checks for drivers. While many in the school bus industry agree that more uniformed federal background checks will streamline the process and create universal disqualifying factors,

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[119] Scott Friedman, "DCS Bus Driver Arrest Exposes Background Check 'Failures,'" NBC 5 Dallas–Fort Worth, November 16, 2016, http://www.nbcdfw.com/investigations/DCS-School-Bus-Drivers-Arrest-Exposes-Multiple-Failures-in-Background-Check-System-401398356.html.

[120] Claudia Newton, "School Bus Experts Debunk Inflammatory CBS Report," School Transportation News, June 29, 2017, http://stnonline.com/news/latest-news/item/8736-cbs-report-on-school-bus-drivers-misleading.

[121] Newton.

[122] Newton.

some argue that these checks dramatically increase the cost of background checks.[123] Allan Jones of the Washington State Office of Superintendent of Public Instruction posits that any new uniform background regulations will also come with a verification process.[124] Jones believes this verification process would require pulling drivers' records more frequently, and the cost of conducting these additional checks and submitting verification results would be solely on the school bus companies and school districts.[125] Budgets and financial concerns always need to be factored into decision making; however, if an incident were ever to occur, the costs of background checks and verification fees may be much less than the public reaction and potential litigation that comes with it.

Even if standardized background checks for bus operators come to fruition, it is the responsibility of the school district and school bus company to ensure that these drivers are properly trained in security and safety functions. Several recent events suggest that bus operators are not properly trained, nor are they following the training that is provided. According to Phillip Sean Curran on news website Central Jersey, a school bus driver unknowingly picked up a 25-year-old man while picking up other students and transported him to Princeton High School.[126] The Curran explains that this incident happened just one week before the school shooting in Parkland, Florida, and the driver of this bus was a substitute. Another New Jersey incident details how a bus driver was caught on video driving over downed power lines with a bus full of children.[127] These incidents display a lack of training and vigilance on the part of school bus drivers. In each case, the driver's

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[123] Kelly Roher, "Who's Behind the Wheel?: Optimizing Driver Background Checks," School Bus Fleet, October 13, 2011, http://www.schoolbusfleet.com/article/612061/who-s-behind-the-wheel-optimizing-driver-background-checks.

[124] Roher.

[125] Roher.

[126] Phillip Sean Curran, "Princeton: School Bus Security Breach in Cranbury Happened with a Substitute Driver," Central Jersey, February 26, 2018, http://www.centraljersey.com/news/princeton-school-bus-security-breach-in-cranbury-happened-with-a/article_a8aab554-1b48-11e8-9958-4ba8dc92daba.html.

[127] Taylor Tiamoyo Harris, "Mom Stunned as School Bus Prepares to Drive across Downed Power Lines," Advance Local Media, March 10, 2018, https://www.nj.com/news/index.ssf/2018/03/company_fires_bus_driver_after_he_attempted_to_run.html.

inattentiveness and lack of situational awareness risked the safety and security of the children on their buses and at the schools.

Fortunately, some bus drivers receive proper training and pay attention during those training courses. On February 21, 2018, a bus driver in Cecilia, Louisiana, confiscated an unloaded pellet gun from a five-year-old student attempting to board the school bus.[128] The fact that it was a very young child carrying an unloaded weapon does not minimize the security concern. The important aspect of this situation is that the driver was vigilant, saw something that could have potentially jeopardized the security of the bus and the school, and acted. Bus drivers are the first adults to interact with students or anyone else trying to access a school bus, and they are the ones who need to receive security training and remain vigilant at all times to help mitigate security threats on school buses.

2. Outreach Activities

a. Baseline Assessment for Security Enhancement

School bus companies and school districts have budgets to which they must adhere, and often, they have competing priorities for the money in their budgets. Several school districts and school bus companies have used a free, voluntary security assessment provided by the TSA, known as the Baseline Assessment for Security Enhancement (BASE). This assessment provides school bus entities with a comprehensive review of security policies, security awareness, security training, public outreach, background checks, emergency response, and more.[129]

Suffolk Transportation Service (STS) is an example of one entity that participated in BASE and made major property investments after receiving its results. TSA's assessment of STS uncovered multiple limitations of its physical security systems—fences,

[128] Lester Duhe, "Superintendent Responds to 5-Year-Old Bringing Pellet Gun on Bus; Wants More Security at Schools," KLFY, February 21, 2018, http://www.klfy.com/news/local/superintendent-responds-to-5-year-old-bringing-pellet-gun-on-bus-wants-more-security-at-schools/985733556.

[129] Transportation Security Administration, "Baseline Assessment for Security Enhancement" (fact sheet, TSA, 2017).

gates, doors, and barbed wire—primarily at its bus yards.[130] Along with physical security weaknesses, the assessment identified key policy issues—one being bus drivers taking company vehicles home at the end of their shifts.[131] Due to the results of BASE, STS installed lighting, fencing, barbed wire, and security cameras at its bus yards to prevent unauthorized access to buses.[132] With these large infrastructure investments, STS also made a simple policy change. Drivers are no longer allowed to park school buses off site; now, drivers must park all buses at the main bus yard where they are locked behind a fence and under video surveillance when not in use.[133] This policy change has allowed STS to have constant oversight of its buses—which enhances overall safety and security due to the reduction of opportunities for anyone to access unattended buses.[134] Although simple, this policy change has had a positive impact on STS's overall security.

STS is just one example of a company using this free service to enhance its security posture and protect its buses and children. STS volunteered for BASE to solidify its system against terrorism.[135] The changes implemented by STS serve a dual role: anti-terrorism and anti-crime. From a homeland security perspective, preventing terrorism is the primary focus of BASE; however, the security measures as a result of the assessment may result in the added benefit of reducing crime on a transportation system.[136] Many other school bus companies and school districts still lack physical security features at their bus yards, and if they do have some features in place, they have only been geared toward preventing

[130] Nicole Schlosser, "Assessments, Investments Bolster School Bus Facility Security," School Bus Fleet, April 8, 2016, http://www.schoolbusfleet.com/article/711642/assessments-investments-bolster-school-bus-facility-security.

[131] Schlosser.

[132] Schlosser.

[133] Schlosser.

[134] Schlosser.

[135] Schlosser.

[136] Transportation Security Administration, "Baseline Assessment for Security Enhancement."

vandalism and theft.[137] Anti-terrorism measures now need to be considered when securing buses and facilities.[138]

b. Training/Exercises/Drills

Many school bus companies are afraid of the potential negative reaction they will receive from school staff, administrators, and parents when they try to conduct security-related exercises on their buses.[139] Their greater fear should be a real-life security incident if their personnel have not been trained appropriately. Sergeant Corey Allinson of the Park City, Utah, Police Department, like many others before him, says, "The body can't go where the mind hasn't already gone."[140] Neither school officials nor school bus operators and monitors are security professionals, so they cannot be expected to respond to a security incident appropriately unless they receive the proper security-focused training. Security training for school bus operators, school districts, and school bus company officials are available, but it just takes seeking out the classes to participate.

Organizations such as the Oregon Pupil Transportation Association offer summer workshops geared toward security awareness and emergency procedures for bus drivers.[141] The Trans Group in Spring Valley, New York, sends its drivers to comprehensive training on pre- and post-trip inspections as well as suspicious activity and the process for documenting it.[142] On a national level, the TSA-sponsored First Observer Plus program "provides transportation professionals with the knowledge needed to recognize suspicious activity possibly related to terrorism, guidance in assessing what they see, and a method

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[137] Claire Atkinson, "How Secure Is Your Bus Yard?," School Bus Fleet, April 1, 2009, http://www.schoolbusfleet.com/article/611598/how-secure-is-your-bus-yard.

[138] Atkinson.

[139] Nicole Schlosser, "5 Tips for Planning School Bus Security Training Exercises," School Bus Fleet, April 5, 2017, http://www.schoolbusfleet.com/article/721789/5-tips-for-planning-school-bus-security-training-exercises.

[140] Lee Benson, "About Utah: Park City Sergeant on School Shootings: 'We Need to Be Even More Prepared,'" Deseret News, March 11, 2018, https://www.deseretnews.com/article/900012669/the-body-cant-go-where-the-mind-hasnt-already-been.html.

[141] "Planning and Training Increase School Bus Security," *Campus Safety*, May 24, 2011, https://www.campussafetymagazine.com/safety/planning-and-training-increase-school-bus-security/.

[142] "Planning and Training Increase School Bus Security."

for reporting those observations."[143] First Observer Plus offers training via several methods: end-user training (in the classroom), training the trainer (information taught to a small group who then brings it back to their organizations), and web-based training. This program is adaptable for all modes of transportation, with specific training available for each mode. These types of training opportunities provide drivers and school bus personnel with the information and tools needed to enhance security.

Along with attending security awareness and suspicious activity training, participating in security drills and exercises is one way to enhance security knowledge and implementation practices. Drills and exercises provide employees with scenarios as close to real life as possible and a subsequent discussion about what went right and wrong during an exercise. This discussion enables individuals to take part in crafting policies and procedures that can be implemented in a real-world incident. The Missouri Center for Education and Safety (MCES) has done exceptional work in providing exercise training to its school bus employees, especially in the active shooter and violent intruder realms.[144] Gary Moore, a safety coordinator for MCES, is trying to get all of the district employees involved in these exercise events.[145] He strongly emphasizes and supports the Department of Homeland Security (DHS)'s "Run, Hide, Fight" initiative for combatting active shooters and violent intruders.[146] Similarly, Maryland State police officer Casey Ruth offers school districts free active-shooter training.[147] Ruth teaches a civil response to active shooter events course that is designed to instruct non-security personnel in what to do during an active-shooter situation anywhere within a school system.

Videos are another useful training tool. Along with DHS's "Run, Hide, Fight" initiative, TSA offers the aforementioned First Observer Plus training videos for all modes

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[143] "First Observer Plus," Transportation Security Administration, accessed October 16, 2018, https://www.tsa.gov/for-industry/firstobserver.

[144] Suzanne Perez Tobias, "School Bus Drivers Learn How to Prepare for 'Active Shooter' Cases," *Wichita Eagle*, October 17, 2015, https://www.kansas.com/news/local/education/article39531525.html.

[145] Perez Tobias.

[146] "Active Shooter Preparedness," Department of Homeland Security, December 7, 2012, https://www.dhs.gov/active-shooter-preparedness.

[147] Marty Madden, "State Cop Offers Free Active Shooter Training to Schools," Bay Net, March 10, 2018, http://www.thebaynet.com/articles/0318/statecopoffersfreeactiveshootertrainingtoschools.html.

of surface transportation. The school bus version targets school bus drivers, focusing on vigilance and security awareness. To date, more than 80,000 bus drivers and 3,000 school districts have viewed TSA's First Observer Plus school bus version.[148] TSA also offers suspicious package identification training, improvised explosive device awareness training, and modal-specific intelligence briefings to all surface transportation stakeholders.

Evolving training and exercise participation by school bus companies and school districts offer preparation to combat a security incident on a school bus or at a school bus facility. As companies continue to grow their training programs, identifying legitimate training courses from reputable sources is essential.

c. Partnerships

Participating in drills and exercises allows school bus companies and school districts to partner with law enforcement agencies, emergency response officials, governmental agencies (at all levels of government), and other industry partners, to name a few. Partnerships developed with local first responders may prove the most beneficial as first responders will be the ones responding to any incident that involves a school bus company. First Student is an industry leader partnering with first responders and federal agencies, such as DHS and the Federal Bureau of Investigation, in security and emergency preparedness drills.[149] From these interactions, First Student has developed its own training tools, which it has shared with school bus associations such as the National School Transportation Association (NSTA).[150] Partnering and sharing information such as this will advance the security efforts of the school bus industry as a whole. Withholding security training and information puts the safety and security of children at risk, which runs counter to the homeland security mission.

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[148] Ryan Gray, "No-Cost TSA Training Highlights School Bus Safety Month," School Transportation News, September 26, 2017, https://stnonline.com/news/latest-news/item/8942-no-cost-tsa-training-highlights-school-bus-safety-month.

[149] Nicole Schlosser, "Contractors Turn to Partnerships, Tracking to Bolster Security," School Bus Fleet," April 13, 2015, http://www.schoolbusfleet.com/article/612351/contractors-turn-to-partnerships-tracking-to-bolster-security.

[150] Schlosser.

Government agencies, specifically TSA, offer security training programs and guidance to all transportation stakeholders that seek to enhance the security knowledge base of their employees. Programs such as First Observer Plus are readily available to everyone for web-based training. In addition, TSA offers security checklists and facilitates drills and exercises; classroom training, such as modal-specific threat briefings, suspicious activity, and explosive recognition training; and general security awareness training. Typically, any transportation organization that seeks security assistance through exercises and training has been welcomed with open arms. TSA as well as state and local emergency management agencies are great resources as their mission is to include all stakeholders to enhance the homeland security enterprise.

In the wake of recent school shootings, the National Rifle Association (NRA) has been demonized. However, the NRA still offers gun safety and other gun-related training courses, which are one of the organization's main purposes.[151] Some schools and law enforcement agencies in Oregon have reached out to the NRA Foundation to be a part of the National School Shield Training program.[152] This free program seeks to foster partnerships with schools and law enforcement agencies while providing the community with vulnerability assessments of schools and school buses. These assessments have specifically targeted school bus drivers for their input on security concerns and points along their routes where buses are most vulnerable.[153] Involving the drivers in these assessments helps to foster ownership of the security of the children and the school bus itself.

A school bus company's implementation of security training programs can be taken a step further by involving the first responder community. In 2004, the New Mexico Public Education Department's School Transportation Bureau (NMPEDSTB) initiated a school bus driver security training program and made it mandatory for all transportation staff

[151] "Home Page," National Rifle Association, accessed April 27, 2018, https://home.nra.org/.

[152] Dan Bain, "Glide Schools Look to Strengthen Safety and Security on Campuses," News-Review, September 28, 2017, http://www.nrtoday.com/news/local/north_county/glide/glide-schools-look-to-strengthen-safety-and-security-on-campuses/article_74ee19eb-940f-5ba8-947e-b7b8b545c44b.html.

[153] Bain.

members.[154] While having an in-house training program is not a unique concept, the NMPEDSTB invited local law enforcement to take part in the program. This interaction helped law enforcement gain perspective on the challenges that school bus operators face and provided school bus operators knowledge from first responders on what is expected of them—from a first response aspect—in the event of a security incident.[155]

Programs such as these not only increase the knowledge base of their recipients but also facilitate interagency and community communication.[156] Once these partnerships are formed, information is more likely to flow freely. Through firsthand observation, agencies continue to receive invitations to conferences, trainings, and exercises after they have had the initial introduction and set the goals they wish to achieve through partnership. The participation at subsequent events continues to grow as more and more agencies communicate their common interest in homeland security and in securing the populations they serve.

d. School Resource Officers

Along with forming training and exercise partnerships with the law enforcement community, many school districts and school bus companies are allowing law enforcement onto their properties and into their schools. School resource officers (SROs) work in many schools across the country. The role of these officers is to provide guidance, mentorship, and safety and security to students.[157] The SRO is not a new concept, but the demand for this type of law enforcement presence has drastically increased since Sandy Hook.[158] According to the National Association of School Resource Officers, the demand for schools wanting SRO training is "through the roof, unlike anything we've ever

[154] "Planning and Training Increase School Bus Security."

[155] "Planning and Training Increase School Bus Security."

[156] "Planning and Training Increase School Bus Security."

[157] Stephanie Saul, Timothy Williams, and Anemona Hartocollis, "School Officer: A Job with Many Roles and One Big Responsibility," *New York Times*, March 4, 2018, https://www.nytimes.com/2018/03/04/us/school-resource-officers-shooting.html.

[158] Marklein, "Schools Tighten Security after Sandy Hook."

experienced."[159] Since Sandy Hook, some school districts and legislatures are going even further than having SROs inside schools. South Dakota has allowed school districts to decide whether they would like to add "school sentinels," which are appropriately trained school employees, security personnel, or community volunteers who carry firearms at schools or on school buses.[160] States such as Texas and Missouri have allowed certain school employees to have concealed firearms on school property as well.[161] Having additional people on school property with firearms, especially non-law enforcement personnel, is already sparking much political debate. Finding ways to add protection—guns in this case—in schools and on school buses exemplifies the notion that proactivity and innovation are necessary for securing the nation's school and school bus security systems.

Jim McKay of *Emergency Management* magazine writes that SROs need to have an intricate knowledge of the school and be effective trainers and listeners.[162] Knowledge of the school is not confined to the campus itself. It must also entail the school bus service—the bus's timetables, the places from which buses are coming, the neighborhoods they traverse, pick-up and drop-off points, and the people on the bus, specifically the adults charged with securely transporting the students to and from school. As law enforcement officials, SROs are viewed as subject matter experts in the security of the school system. SROs should embrace that image and strive to train all the members of the school community on security awareness, vigilance, and proper policies and procedures for responding to emergency and security events—both on school grounds and on school buses. In addition to providing training to the school community, SROs can partner with intelligence and training officers to better understand the potential threats impacting the school system and its community. If SROs proactively seek out this information, it increases the likelihood they will be able to provide relevant training to the school

[159] Marklein.

[160] Marklein.

[161] Marklein.

[162] Jim McKay, "School Resource Officers Are More Than a Cop with a Gun," *Emergency Management*, March 2018, http://www.govtech.com/em/safety/School-Resource-Officers-Are-More-than-a-Cop-with-a-Gun-.html.

community and be prepared to handle real-world threats to schools, students, and school transportation. McKay's last point about listening is critical. SROs have the opportunity to engage students and have conversations with them. These conversations will likely be innocuous, but they serve to build trust within the school community and could lead to students confiding in the SROs when something serious or threatening has occurred.[163] The more knowledge SROs have about the schools and their communities, the better equipped they will be to mitigate potential threats before they occur.

Putting more firearms in schools is a huge political debate, with the country seemingly divided on the best answer. While having additional guns in schools may help quickly to resolve a situation, such as the one at Sandy Hook, it may also be placing guns in the hands of people that are not adequately trained in firearm tactics and safety. All of the aforementioned concerns are valid, but the additional value that SROs bring, aside from guns, needs to be factored into the equation. For SROs to be properly utilized, they have to be viewed as more than just a security detail. While SROs may be the first to engage a school shooter, they also instill a layered security approach throughout the school district. SROs are an integral part of the school community by engaging with the entire population: students, parents, teachers, coaches, counselors, custodians, administration, bus drivers, and bus monitors. Discussions about all aspects of SROs need to take place to develop policies and strategies to increase the security of U.S. schools and school transportation.

e. Additional Practices

School districts and school bus companies can also employ options that are less politically controversial than embedding individuals with guns into schools and on school buses. The Reynolds School District in Fairview, Oregon, allows their local police forces to fuel their vehicles inside the district's school bus yards.[164] Another strategy employed by agencies throughout various modes of transportation is having police officers park in front of their buildings or within their parking lots. The parked cars can be either occupied or empty and used as a decoy. This is another example of a practice that has anti-terrorism

[163] McKay, "School Resource Officers Are More Than a Cop with a Gun."

[164] "Planning and Training Increase School Bus Security."

and anti-crime benefits. Police officers have daily reports to complete, and often, they complete these reports from their onboard vehicle computers. When police officers park their vehicles for a break or to complete reports at a school, school bus yard, or any transportation-related facility, they immediately enhance the security of that venue by their mere presence. A report out of Indianapolis details how decoy police cars have helped to eliminate incidents at various locations throughout the city completely.[165] The decoy strategy does come with some downsides as an officer might not be available to provide immediate response in the adjacent area. Decoy police cars have also been vandalized in some areas when individuals discovered the cars were unattended.[166]

Another simple security measure is allowing first responders to train on actual school buses.[167] This allows them first-hand knowledge of some of the intricacies of the vehicles. If first responders become familiar with school buses, they will be better equipped to respond, gain access to, or externally shut down a bus during a real-time security incident or another emergency. While imperfect, these tactics require little to no monetary investment to implement proactive approaches to enhance security.

3. Technology

a. Video Monitoring and Surveillance

Policy changes, as seen in Dale County and at STS, and the implementation of geofencing, lighting, and barbed wire are effective enhancements for school buses and the yards they are stored in. These options can be inexpensive compared to other technological and personnel improvements that should be considered.[168] Since Sandy Hook, many schools have chosen to increase the number of locked doors that incorporate visitor

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[165] Aishah Hasnie, "Officer's Decoy Police Car Business Helps Deter Crime," FOX 59, January 14, 2015, https://fox59.com/2015/01/14/officers-decoy-police-car-business-helps-deter-crime/.

[166] Associated Press, "4 Accused of Trashing Police Car Parked Near Police Station," U.S. News, August 8, 2017, https://www.usnews.com/news/best-states/florida/articles/2017-08-08/4-accused-of-trashing-police-car-parked-near-police-station.

[167] Schlosser, "Planning School Bus Security Training Exercises."

[168] Atkinson, "How Secure Is Your Bus Yard?"

vestibules or check-ins (buzz-ins) as well as video and audio surveillance.[169] School bus companies are also utilizing surveillance equipment. These camera systems serve multiple purposes: security, safety, crime deterrence, and accident monitoring.[170] Surveillance systems allow for potential real-time video feeds for school bus companies and school systems to monitor live activities and respond quickly to incidents. They offer accountability for drivers by ensuring they are following traffic laws as well as monitoring their behavior to ensure students are safe and secure. Parents also experience peace of mind in knowing that these systems are watching over their children while they are going to and from school.[171]

Many school districts across the country have updated their current camera systems or installed brand new systems. Recently, Albuquerque Public Schools (APS) spent approximately $200,000 to equip many of its school buses with video and audio recording capabilities.[172] West Middlesex, Pennsylvania, schools just spent over $27,000 to upgrade their school bus camera systems.[173] This upgrade provides better picture quality and enhances the video storage capability. While APS sees this upgrade mainly as a reactionary safety measure meant to reduce bullying and disciplinary issues, it also serves as a security measure.[174] With over half of its fleet equipped with these monitoring systems, APS has created a proactive security measure designed to deter criminal, terrorist, or inappropriate behavior on their buses. Along with school districts adding cameras to their buses on their own, some school districts are requiring that their bus contractors install video and audio

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[169] Marklein, "Schools Tighten Security after Sandy Hook."

[170] Joey Campbell, "Video Camera Advances Improve Bus Safety, Inside and Out," School Bus Fleet, December 1, 2001, http://www.schoolbusfleet.com/article/610334/video-camera-advances-improve-bus-safety-inside-and-out.

[171] Sonia Mastros, "Transparency: Benefits of Video Surveillance in School Buses," Bus Boss, April 5, 2016, https://www.busboss.com/blog/transparency-benefits-of-video-surveillance-in-school-bus-transportation.

[172] Chris McKee, "Albuquerque Public Schools to Add Security Cameras on 70 School Buses," KRQE, October 17, 2017, http://www.krqe.com/news/albuquerque-public-schools-to-add-security-cameras-on-70-school-buses_20180305061703589/1009292093.

[173] David Dye, "School Buses Getting Cameras," *The Herald* (Mercer County), February 28, 2018, http://www.sharonherald.com/news/school-buses-getting-cameras/article_38ad7210-ec56-5136-a389-2b5f373c706a.html.

[174] McKee, "Albuquerque Public Schools to Add Security Cameras."

recording systems to obtain school transportation contracts. Lucini Bus Lines in Massachusetts recently renewed its contract with the Bridgewater-Raynham (B-R) school district by agreeing to the district's new contract terms.[175] Half of the B-R school buses are now equipped with four interior cameras—one of which specifically monitors the door—allowing for district officials and police to have a clear picture of everyone accessing the bus. Lucini has also committed to testing the cameras' live-stream capabilities. B-R district superintendent Derek Swenson emphasizes that these contract demands are not the result of incidents on their buses. Swenson states, "With the world we live in today, we just want to make sure our kids are safe." Video and audio recordings serve as an invaluable tool to ensure the safety and security of children while they transit to and from school.

Another security camera is helping improve the safety and security of children boarding buses. The problem of drivers illegally passing stopped school buses persists. Often, security or "stop arm" cameras are installed on school buses to capture license plate information and deter drivers from illegally passing school buses. In Bibb County, Georgia, police have issued over 900 citations for this type of infraction.[176] While these cameras are designed specifically to curtail this type of activity, they offer the added benefit of capturing accident footage or other incidents involving school buses. The school bus involved in the October 31, 2017, New York City terrorist truck attack was not the intended target, but the school bus full of children ended up right in the middle of the incident. When the terrorist slammed his Home Depot rental truck into the school bus, he pulled the bus and everyone on it into a terrorism investigation.[177] It is unclear whether that particular school bus had a surveillance camera system on it, but if it did, law enforcement officials could have used the recordings to gather footage and evidence of the attack. Witness accounts of attacks are crucial but might not capture all of the details. Cell phone footage

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[175] Sara Cline, "Smile! You're on a Bridgewater-Raynham Bus, and on Camera," *Taunton Daily Gazette*, October 11, 2017, http://www.tauntongazette.com/news/20171011/smile-youre-on-bridgewater-raynham-bus-and-on-camera.

[176] Matt Thielke, "Officials Hope School Bus Cameras Will Help Keep Bibb Students Safe," WGXA, September 27, 2017, http://wgxa.tv/news/local/officials-hope-school-bus-cameras-will-help-keep-bibb-students-safe.

[177] Del Real and Kilgannon, "Mangled School Bus."

is also useful to law enforcement, but the recordings often start too late and do not capture the entire incident. School bus cameras are designed to capture footage while the bus is running, and functional surveillance cameras can provide a full account of an incident on a bus.[178]

Video surveillance monitoring systems do come with drawbacks, though. These systems can be very costly, especially when older facilities need retrofitting for a camera system.[179] Camera systems are also useful in investigating past incident to review and gather evidence, but camera systems can be ineffective in real time. If an entity does not have an individual monitoring a camera system or a distress signal that alerts someone to monitor a camera, the system is solely a video recording of past events that offer no real-time security. Additionally, these systems are useless if they are not functioning correctly. A Texas mother discovered this when her child described an incident on the school bus. The mother explained that when she went to the school district to view the video footage of the incident, it was not available because the cameras on that bus had been broken.[180] Luckily, no one was hurt during the incident; however, had there been a legitimate attack on the school bus, the technology designed to enhance security would have been entirely useless.

There is further concern that video and audio surveillance systems are invading the privacy of children and school bus drivers. Boston's school department has installed audio surveillance capabilities, in addition to video surveillance, on approximately 750 school buses.[181] While audio surveillance offers safety and security benefits, the legality of its collection is being debated. The American Civil Liberties Union (ACLU) has suggested that these audio recordings are teaching our children that Big Brother is always watching

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[178] Thielke, "Bus Cameras Will Help Keep Bibb Students Safe."

[179] Atkinson, "How Secure Is Your Bus Yard?"

[180] Trason Bragg, "Mother Concerned with Inoperative Cameras on La Feria ISD School Bus," KRGV, December 15, 2017, http://www.krgv.com/story/37073580/mother-concerned-with-inoperative-cameras-on-la-feria-isd-school-bus.

[181] "Boston Schools Go Too Far with Audio Surveillance of School Buses," *Boston Globe*, July 28, 2014, https://www.bostonglobe.com/opinion/editorials/2014/07/28/boston-schools-too-far-with-audio-surveillance-school-buses/xTGLf41L72tLtnPX77WWDM/story.html.

and listening to them.[182] Consequently, school systems and school bus companies should conduct a cost–benefit analysis of these systems to determine which methods of security work best for their organizations and students while ensuring they are not infringing on the rights of any individuals aboard the buses.

b. Global Positioning System

Another costly security system that works very well when effectively monitored is a global positioning system (GPS). GPS offers several key features: instant location tracking, speed monitoring, stop monitoring, panic buttons and "fencing," which uses GPS radio frequencies to form a virtual boundary around a specific location.[183] Location services, panic buttons and "fencing" in particular allow a company to receive an alert if a vehicle has deviated from its scheduled route; these features can play an essential role in the event of a hijacking or kidnapping.[184]

Many school districts and school bus companies have already installed this technology on their buses. These systems provide real-time tracking of buses, allowing parents to verify that their child's bus is on time and on its appropriate route. For instance, the Cherokee County School District in Georgia uses the Versatrans My Stop system.[185] This system becomes available to parents within 15 minutes of the scheduled arrival time of their child's school bus. Once activated, the Versatrans system allows parents, from their website or mobile app, to see the bus's approximate arrival time and know whether it is late and whether it has deviated from its regular route.[186] East Baton Rouge, Louisiana, schools are installing a similar technology on their 600-plus buses, which parents can

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[182] "Boston Schools Go Too Far."

[183] Jason Fitzpatrick, "What Is ''Geofencing''?," How-to Geek, September 21, 2016, https://www.howtogeek.com/221077/htg-explains-what-geofencing-is-and-why-you-should-be-using-it/; and Hann, "Rethinking School Bus Safety."

[184] Hann, "Rethinking School Bus Safety."

[185] "CCSD Piloting Bus Tracking System for Parents at Three Schools," Cherokee County School District, February 22, 2018, http://cherokeek12.net/blog/2018/02/22/ccsd-piloting-bus-tracking-system-for-parents-at-three-schools/.

[186] Cherokee County School District.

access via the "Where's the Bus" app.[187] The Trip Spark system, which the school district has employed, tracks the school system's buses in real time as well as the time, history, and speed of each bus in its fleet.[188] While features like this help schools to enforce safety and speeding policies, they also could provide a critical piece of evidence during security events. Bus drivers are trained in operating procedures and acceptable driving speeds in certain terrain while hijackers most likely are not. Thus, if a bus is hijacked and driven by an unauthorized driver, school officials may quickly notice if the speed of the bus, which can be tracked in the Trip Spark system, does not correspond with its location. In this situation, the school may be able to involve law enforcement quickly enough to mitigate a potentially disastrous situation.

Zonar, one of the leading school bus GPS systems, has partnered with Safestop to enhance its tracking capabilities, which will lead to increased school bus security.[189] Some of these enhancements include estimated arrival times, much like subway systems across the country display; push notifications for delays, weather, and security incidents; dedicated support services to alleviate the burden of school districts and school bus companies; route optimization guidance; and optimization of onboard camera systems, GPS, and engine inspections.[190] Along with its enhanced technology plans, Zonar awards grants in upward of $50,000 to NSTA members.[191] While $50,000 is unlikely to equip an entire school bus fleet with the latest safety and security technology, it is a starting point for many school districts and school bus companies that have nothing in terms of security. Enhancing the security of school children while going to and from school is paramount,

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[187] Cheryl Mercedes, "GPS Tracking Devices Approved for EBR School Buses," WAFB, December 18, 2017, http://www.wafb.com/story/37093581/gps-tracking-devices-approved-for-ebr-school-buses.

[188] Mercedes.

[189] "Zonar Integrates Leading School Bus Tracking App into Its Smart Fleet Management Solutions; Announces New Partnership with SafeStop," Cision, October 11, 2017, http://www.prweb.com/releases/2017/10/prweb14788824.htm.

[190] Cision.

[191] Ryan Gray, "Zonar Tech Grant Opportunity Returns for School Bus Contractors," School Transportation News, April 16, 2018, http://stnonline.com/news/latest-news/item/9399-zonar-technology-grant-opportunity-returns-for-school-bus-contractors.

and NSTA members have the opportunity to apply for these grants, regardless of what security methods they already have in place.

While these systems offer the practical everyday purpose of informing parents and children where the bus is so that they do not have to wait outside in adverse weather, they also provide security information. Schools and parents now have the ability to take an active role in the security of their children while on school transportation. Schools and parents can now see if a bus is exceedingly late or drastically off course and contact the police if they feel something is amiss.

One problem with school bus tracking is that it only tracks the school bus. School officials and parents cannot be sure that individual children are physically on the buses they are tracking with GPS technology. Additionally, hacking can be an issue for GPS as many systems may not be secure enough to keep hackers out.[192] Hackers potentially have the ability to track vehicles, disable the GPS tracker, or feed false coordinates to the systems that are monitoring the GPS.[193] Purchasing a GPS with strong encryption can help prevent hacking, but school districts and school bus companies that actively monitor their systems and look for discrepancies enhance this layer of security even further.

c. Radio Frequency Identification

To take GPS a step further, STS has partnered with SchoolSource Technologies to monitor students' access to buses using radio frequency identification (RFID).[194] This technology requires a student to carry—and not to lose—an RFID tag and provides the ability to log students on and off the bus, matches them with their legal guardians, alerts parents or authorities if a child is not where she is supposed to be, and helps locate children in conjunction with GPS.[195] As of April 2018, all elementary through high school students of the Saratoga Springs City School District in New York have been provided a bus

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[192] Kim Zetter, "Hackers Could Heist Semis by Exploiting This Satellite Flaw," *Wired*, July 30, 2015, https://www.wired.com/2015/07/hackers-heist-semis-exploiting-satellite-flaw/.

[193] Zetter.

[194] Schlosser, "Contractors Turn to Partnerships."

[195] Schlosser.

identification card with their name and picture.[196] Saratoga Springs students are now required to use this ID to get on and off their buses. Through a mobile app, this technology provides parents and school officials real-time updates of any student's location once she has scanned onto her bus. Cleveland City Schools are utilizing both GPS and RFID. The "Here Comes the Bus" app gives parents and anyone else they designate the ability to track their child's bus location and then receive a push notification when their child exits the bus.[197] While this technology is seen primarily as a measure to ensure students are getting on and off their buses at the appropriate locations, it also serves to enhance overall school bus security. In the event of a bus hijacking or hostage situation, RFID allows schools and parents to provide law enforcement with a GPS location of their children. In a case like the Dale County, Alabama, hostage standoff, RFID would enable law enforcement to expedite its response and resolve the incident as soon as possible.

RFID tracking clearly has benefits for schools and parents; it allows them to know where their children are and whether they are at the correct location given the time of day. However, this type of technology also presents concerns. Like any other technology, RFID has the potential to be hacked. These chips can be read at a distance, and computer savvy stalkers could gain access to the location of children.[198] Others are concerned that this is another way for Big Brother to monitor children and families. Schools insist they are not tracking students but watching for anomalies in location behavior.[199] Also, if students forget or lose their RFID, they may not be able to board their buses, causing them to be left at bus stops or at school seeking alternate means of transportation. Technology can play a critical role in securing children and the school bus system, but it must be used

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[196] Joe Gullo, "Local School District Adopts Bus ID Card System," WTEN, January 10, 2018, http://www.news10.com/news/local-school-district-adopts-bus-id-card-system_20180327041922564/1081543766.

[197] "Here Comes the Bus App Is Available for Cleveland City Schools Parents and Students," Chattanoogan, February 16, 2018, http://www.chattanoogan.com/2018/2/16/363501/Here-Comes-The-Bus-App-Is-Available.aspx.

[198] Christopher Zara, "Invasion of Privacy? RFID Tracking Kids on School Buses; Privacy Advocates Concerned By 'Attendance Management' Pilot Program in Gordon County, Ga," *International Business Times*, April 20, 2013, https://www.ibtimes.com/invasion-privacy-rfid-tracking-kids-school-buses-privacy-advocates-concerned-attendance-management.

[199] Zara.

appropriately. It is the job of parents and citizens to ask the right questions and gather information about the technology being used to determine whether it is best for their children.

C. CONCLUSION

The United States does not always agree with the security policies and practices of foreign countries. However, providing safety and security to children during their trip to and from school should be universally accepted. Regardless of the condition of the buses or the elements to be navigated, the safety and security of students while on a school bus is a common goal. While the United States may have the most formal and robust school transportation system, it can still learn from overseas practices. The United States should also be a willing partner in sharing its school bus security strategies with allies as they try to develop or enhance their programs. While the current threat to school buses may be low, any attack against this conveyance would be shattering. America has seen too often the devastation caused by school shootings; the results would be no different if the attack moved to a school bus. Completely eradicating this type of violence is unlikely, but with so many countries focusing on implementing or enriching school bus security programs, there are many methods available to mitigate threats to school buses. Comparing American policies to those of other countries is a great way to start.

Many effective security strategies are being employed throughout the American school bus transportation industry. Technology, outreach, and school bus drivers themselves all provide security to children through proactive security solutions. The problem with the current school bus security posture is that it is not evenly distributed throughout the industry. Installing a minimum security standard for school bus transportation is necessary to provide an equal level of security for all children throughout the country. Federal security regulations will be the most effective and efficient way to achieve this goal. Chapter IV analyzes the methodologies necessary to assess system vulnerabilities and inform the areas in which regulations could be successful. Additionally, aviation and other surface modes of transportation are analyzed to depict how regulations

in these industries have been effective. Recommendations for regulation implementation follow this analysis.

IV. ANALYSIS OF THE SCHOOL BUS SYSTEM

Despite having the most extensive school bus transportation system in the world, there are numerous lessons the United States can take from other American transportation systems and countries around the globe when it comes to enhancing school bus security. It is true that there have been minimal incidents involving schools, but that should not preclude the implementation of critical security regulations designed to prevent threats proactively. There are multiple risk models that can be applied to the school bus transportation sector to mitigate risk and inform the creation of security regulations. Federal security regulations in the aviation industry have provided the framework and oversight to ensure the safety and security of airline passengers. Enacting regulations based on the methodologies and recommendations, as put forward in the subsequent chapter, offer the opportunity to protect children, which is something that everyone can support.

A. METHODOLOGIES

1. Measure of Performance

According to the Washington State Office of Financial Management, "A performance measure is a numeric description of an agency's work and the results of that work. Performance measures are based on data, and tell a story about whether an agency or activity is achieving its objectives and if progress is being made toward attaining policy or organizational goals."[200] Author Todd Litman explains that for transportation systems, there are a variety of ways to measure performance: on-time arrivals, accidents reductions, customer satisfaction, or accessibility of service in some popular areas.[201] Litman continues by discussing how specific departments within a transportation agency may measure performance differently. When assessing performance, it is important to clearly define the area being measured and analyze the goals and objectives of that area to determine levels

[200] State of Washington Office of Financial Management, *Performance Measure Guide* (Olympia, WA: Washington Office of Financial Management, August 2009), 2.

[201] Todd Litman, "Measuring Transportation: Traffic, Mobility and Accessibility," *ITE Journal* (October 2003): 32.

of success. Concerning security, school bus systems should be measuring their performance based on their success rates of transporting students from their bus stops—presumably close to their homes—to schools and extracurricular activities and then back to their homes without encountering a security incident. The United States has seen minimal security incidents involving school buses, which suggest that school bus systems are performing well in this area. However, a lack of security incidents does not necessarily mean that the school bus system has successfully created a secure environment for students. This success showcases results without analyzing whether security systems have been enacted to impact the security performance of school buses directly.

Parents expect that when their children are on school buses, they will reach their destinations on time—safe and secure. Distinguishing how regulations should be implemented to enhance security throughout a school bus transportation system requires, first, identifying how the school bus system is supposed to operate. School bus transportation systems are designed to be fixed-route mass transit systems with a designated final destination. Unlike passengers of public mass transit systems, virtually everyone on a school bus is headed to the same place. Furthermore, school bus agencies and school districts assign specific bus stops where children assemble while they wait for the bus to arrive. Once children are on the school bus, selecting a particular stop is not an option. All bus routes are publicly available and provide the exact location and scheduled pick up time for every stop. This transparency is excellent for parents and students as it allows them to plan their schedule. On the other hand, it provides potential adversaries with details to plan coordinated attacks against school buses. When creating and evaluating performance measures, school bus companies need to consider adversaries and cultivate strategies that address the attacker-defender model.

After understanding how school buses are supposed to operate, security performance measures can be addressed throughout the school bus system. For example, the effectiveness of security training for agency employees can be measured by observing how drivers or maintenance personnel conduct their pre-and post-trip vehicle security inspections to ensure that suspicious or potentially dangerous objects and devices are not present on or around the school bus. Assessing a driver's response or description of an

incident or accident can highlight the driver's ability to evaluate his surroundings and manage a security incident. Additionally, the performance of physical security barriers can be measured by inspecting camera angles to verify that blind spots do not exist or inspecting gates and fencing to ensure they are functioning as designed and not allowing unauthorized access to school bus property. All systems need to measure their performance to gauge whether they are achieving optimal functionality. Measuring performance provides an opportunity to assess gaps and the potential risks that a system may face. Once those vulnerabilities are identified, a system can then begin to develop mitigation strategies to bring the system to its full performance level.

2. Risk

The analysis of performance measures can identify potential gaps or vulnerabilities in the system. According to the Department of Homeland Security's Interagency Security Committee, "Risk is a function of values of threat, consequence and vulnerability. The objective of risk management is to create a level of protection that mitigates vulnerabilities to threats and the potential consequences, thereby reducing risk to an acceptable level."[202] By understanding prospective risks, a system may be able to address and mitigate potential risk factors before an incident occurs. In his book *The Failure of Risk Management*, John Hubbard defines risk as "the probability and magnitude of a loss, disaster, or other undesirable event."[203] Each school bus agency must determine which risks they face and decide how to mitigate those risks. They should also calculate the probability of those risks so as to allocate resources, such as time, money, and personnel, effectively. The following equation is used to determine risk: *Risk = Threat* x *Vulnerability* x *Consequence*.

Using this equation, the Federal Emergency Management Agency defines *threat* as the likelihood an attack takes place, *vulnerability* as the probability a given attack will be successful, and *consequence* as the measurable outcome of the attack, such as loss of life

[202] Interagency Security Committee, *The Risk Management Process for Federal Facilities: An Interagency Security Committee Standard* (Washington, D.C.: Department of Homeland Security, 2013), https://www.dhs.gov/sites/default/files/publications/ISC_Risk-Management-Process_Aug_2013.pdf.

[203] Douglas Hubbard, *The Failure of Risk Management* (Hoboken, New Jersey: Wiley, 2009), 8.

or destruction of infrastructure or property.[204] This equation, referred to as "TVC," predicts what will happen. Using this formula requires an agency, first, to identify potential threats it may face, second, to estimate the system's vulnerability to the threat and the risk of the event happening, and, third, to evaluate the consequences, or costs, if the event occurs.[205] This formula allows analysts and policymakers to design features, such as mitigation strategies, and to determine how they will function against various attacks, or system disruptions, that adversaries or non-deliberate actors might perpetrate. While TVC provides a framework for addressing potential risk areas, it is not a foolproof tool. TVC is better suited for non-deliberate threats, such as weather incidents, because natural disasters offer historical data, which help calculate the probability that another natural disaster will happen.[206] When it comes to attacks against school buses, a sophisticated adversary or group might launch the attack. Considering there are many different ways to attack a school bus system and threats are always changing, the TVC framework cannot be accurately applied to mitigate deliberate attack risks. Deliberate adversaries can adapt their attack methods and target other areas of the system, which may not have been initially considered a risk, making it difficult to model the threat using TVC.

3. Game Theory

Game theory brings order to the strategic choices of decision-makers.[207] Theodore Turocy and Bernhard von Stengel define the term "game" as a strategic situation that pits "players" against each other through the decision-making process, whereby one player's decision affects the decision, or strategy, of another player.[208] John von Neumann's 1928 article, "Theory of Parlor Games," primarily examined economic behavior through

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[204] "Building Design for Homeland Security," Federal Emergency Management Agency, 17, accessed November 9, 2018, https://www.fema.gov/fema-e155-building-design-homeland-security-course.

[205] Norman Ferrier and C. Emdad Haque, "Hazards Risk Assessment Methodology for Emergency Managers: A Standardized Framework for Application," *Natural Hazards* 28, no. 2–3 (March 2003).

[206] Nancy Renfroe and Joseph L. Smith, "Threat/Vulnerability Assessments and Risk Analysis," Whole Building Design Guide, August 8, 2016, https://www.wbdg.org/resources/threat-vulnerability-assessments-and-risk-analysis.

[207] Theodore Turocy and Bernhard von Stengel, *Game Theory* (London: London School of Economics and Political Science, October 8, 2001).

[208] Turocy and Von Stengel.

competitors.[209] His theory of analysis has been applied in a much broader context, in areas such as politics, and can be applied to the attacker-defender scenarios that may face school bus companies.[210] Game theory presupposes that individuals seek specific objectives and make their decisions based on their knowledge of how another individual may behave.[211] This suggests that individuals involved in the competition are rational actors whose behavior corresponds with and is driven by another rational actor. Game theory offers an analytical methodology designed to assess an adversary's best action, or attack vector, vis-à-vis the best counteraction a defender can employ. When addressing deliberate threats from rational actors, defenders should model their system from their own perspective of how it should function, prepare to defend against the worst-case scenario, and counter-attack with security adjustments and investments.[212]

The attacker-defender (AD) game for school bus companies serves as a zero-sum two-player sequential game. In this game, the zero-sum aspect represents a distinct reward and cost for the players involved.[213] The AD model best addresses deliberate threat scenarios because it focuses on the worst-case scenario a system may face. In the case of school buses, an attacker is looking to potentially disrupt service, inflict damage to the system, or create casualties and injuries to the passengers on board. In response, the school bus companies seek strategies to mitigate these potential threats. As a school bus company implements a strategy to suppress an attacker's advances, the attacker will attempt to develop a different approach. These back-and-forth decisions will continue until the costs outweigh the reward, which applies to both sides. Theoretically, when the cost of an attack

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[209] H. W. Kuhn and A. W. Tucker, "John Von Neumann's Work in the Theory of Games and Mathematical Economics," *Bulletin of the American Mathematical Society* 64, no. 3 (May 1, 1958): 100–123, https://doi.org/10.1090/S0002-9904-1958-10209-8.

[210] "Emile Borel: The Forgotten Father of Game Theory," *Von Neumann and the Development of Game Theory* (blog), accessed August 24, 2018, https://cs.stanford.edu/people/eroberts/courses/soco/projects/1998-99/game-theory/neumann.html.

[211] Martin J. Osborne and Ariel Rubinstein, *A Course in Game Theory* (Cambridge, MA: MIT Press, 2006).

[212] Rudy Darken and Thomas Mackin, "Game Theory in Critical Infrastructure Analysis" (presentation, Naval Postgraduate School, January 16, 2018).

[213] Emilio Frazzoli, "Principles of Autonomy and Decision Making" (lecture, Massachusetts Institute of Technology, December 6, 2010), 47.

is more than the reward the attack will produce, the attacker should retire from the game. The same goes for the defender; once the cost of protecting the system is greater than the reward of protecting the system, the defender will relent. For instance, a defender in the school bus system is unlikely to afford to place an armed guard on each school bus. Should it get to this level, the defender will have to assess the costs to the company and determine an acceptable level of risk to defend against and implement its defense mechanisms accordingly. Protecting against all risks and attacks is impossible. Given the focus on deliberate threats, the AD methodology is the most appropriate model for assessing potential school bus attacks. Thus, a school bus system should strive to implement strategies that best protect against the most probable worst-case scenarios and adjust to the evolving threats presented by their potential attackers.

4. Fault Tree Analysis

Pat Clemens and Jacobs Sverdrup define a fault tree (FT) as a graphical model illustrating potential factors that could lead to the malfunction or incapacitation of a system.[214] Fault tree analysis (FTA) helps to create the picture of a system and outlines the areas where the system is vulnerable, may fail, or could be exploited. An FT can illustrate how a system's performance changes as certain components within the system are eliminated or become ineffective. In understanding where a system is vulnerable, the operator of the system has the opportunity to mitigate those vulnerabilities before an incident or attack. FTA looks at a system from its desired measure of performance and then works from the top down. In their book *System Reliability Theory: Models, Statistical Methods, and Applications*, Marvin Rausand and Arnljot Hoyland explain how FTA uses logic gates to demonstrate a system's relationship when certain factors act against the system.[215] Rausand and Arnljot detail how "OR" gates impact the system as long as one of the factors occur. They describe "AND" gates as factors that require additional input, which creates a system failure of some scale. Clemens and Sverdrup summarize OR and AND

[214] Pat L. Clemens and Jacobs Sverdrup, "Fault Tree Analysis," 4th ed. (presentation, Sverdrup Technology, May 1993), 5.

[215] Marvin Rausand and Arnljot Hoyland, *System Reliability Theory: Models, Statistical Methods, and Applications*, 2nd ed. (Hoboken, NJ: Wiley, 2004).

gates as follows: OR gates "produce an output if any input exists" and AND gates "produce an output if all inputs co-exist."[216] The important thing about OR and AND gates is that they help to generate the probability that events may occur. Events stemming from OR gate scenarios have a greater probability of occurring compared to AND gate scenarios because they are individual occurrences that do not require a linked event. AND gates offer a lower probability of a disruption event because multiple factors need to coexist to generate a disruption.

School bus system performance is measured by the ability to deliver children to school safely and securely. An FTA for a school bus system is designed around potential deliberate and non-deliberate events. Each of these types of events focuses—primarily—on OR gates as many singular actions cause a school bus system to fail.

Non-deliberate threats to school buses consist of human-made and natural events. Human-made events may be traffic accidents caused by another party or school bus driver negligence. While accidents and negligence may not cause catastrophic damage or harm, they do have the potential to jeopardize the safety and security of the students on board, cause the school bus system to run at less than full capacity, or even shut down the system depending on the type of accident or location. Natural hazards, such as downed trees or telephone poles, natural disasters, and bad weather can have a great and lasting impact on a school bus system. School systems throughout the Northeast experience these system failures seemingly on a yearly basis given the large snow storms that frequent the region. Likewise, California is no stranger to system shutdowns related to natural disasters as it has endured repeated wildfires that cause school cancellations and destroy property. Through FTA, school districts and school bus companies can assess these events and gauge the probability of their occurrence. Understanding the probability of these events and the areas of the system most affected may afford school bus companies and schools a better chance of mitigating the impact and keeping their systems functioning.

[216] Clemens and Sverdrup, "Fault Tree Analysis."

B. A FAULT TREE ANALYSIS OF THE SCHOOL BUS SYSTEM

Deliberate threats facing school bus systems can be broken down into two main categories: outside actors and insider threats. A variety of individuals or groups could be considered outside actors: terrorist organizations, homegrown violent extremists, disgruntled parents, common criminals, or a host of others intent on harming a school bus. Specific OR gate threats from these outside actors may include improvised explosive devices (IEDs), active shooters, bus sabotage, vehicle ramming, or hijacking. Potential insider-threat OR gate events may involve a deliberate crash, an IED, sabotage, hostage taking, or an active shooter. Outside actors and insider threat scenarios are similar except that the insider threat poses an even greater vulnerability as the person already has intimate knowledge of the system and most likely direct, unhindered access to the system.

FT can be used with TVC or AD, but for this thesis, the FTA focuses on AD. If they use the AD methodology, school bus systems face a plethora of potential attack scenarios, any of which could cause an entire system to shut down. Figure 2 depicts five potential deliberate threats from outside actors and four potential deliberate threats from insiders (see the Appendix for an enlarged version). The shared threat of IEDs could cripple an entire school bus system even if one IED was discovered on one bus. This method of attack does not even have to produce a result. The placement and discovery of the device are likely enough to shut down the entire system. If an IED were to be discovered or explode, the rest of the system would be taken offline by the school bus agency or law enforcement. All school buses in that system would be halted out of fear that further devices or threats might be ongoing. School bus systems in the surrounding areas and communities would likely be shut down pending an investigation to ensure that the threat is contained. The attack methods in Figure 2 do not present an exhaustive list of threats, but should any of these threats be carried out, the impact to the system is likely the same: a full shut-down until the system regains its full performance measure—the secure transport of children to and from school and school-related activities.

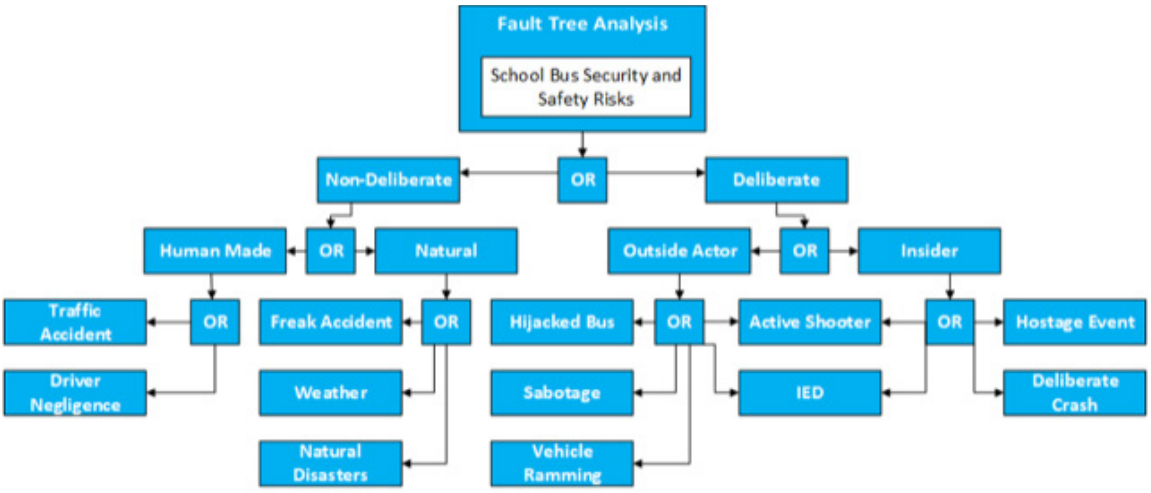

Figure 2. Fault Tree of a School Bus System

Again, using the AD methodology, the FT in Figure 3 depicts how threats might be carried out from an AND gate perspective (see the Appendix for an enlarged version). Regarding an outsider perpetrating a hostage situation, he would need to have knowledge of the school bus routes, bus stops, and schedule times. Given that this knowledge is publicly available, a potential hostage taker would have all the information necessary to carry out this style of attack. Additionally, an attacker intending to target a specific student would need to know which school bus that student rides. If that attacker knows where that student lives, it would be easy to ascertain which school bus the student will be riding. An insider perpetrating a hostage or hijacking event would need to have access to the school bus. This likely reduces the potential attacker pool to bus drivers, bus monitors, and maintenance personnel as they are most apt to have bus keys and be in proximity to school buses. Defending against hostage or hijacking attacks from outside actors would begin with the decision not to display school bus route information publicly. There are already many applications for wireless devices that connect teachers, parents, and students.[217] In this technological age, almost everyone has a wireless device of some kind. Providing school bus route information through an application directly linking the school system, parents,

[217] Bridget McCrea, "7 Free Apps for Keeping Parents and Teachers Connected," Journal, June 11, 2013, https://thejournal.com/articles/2013/06/11/7-free-apps-for-keeping-parents-and-teachers-connected.aspx.

and children would limit the distribution of this information. Thus, limiting knowledge would make it a bit more difficult to plan this type of attack.

As discussed earlier, the threat or discovery of an IED is likely to shut down an entire school bus system, which would likely lead to panic and parents questioning whether it is safe to send their children to school. Looking at this threat through AND gates for both outside actors and insiders reveals that an individual needs access to a school bus to initiate this attack method. For an outsider, the FT in Figure 3 shows that access is needed to begin this attack. However, the method of access might be obtained through different variables. The outsider example depicts how the OR gates of gaining unauthorized access to the bus or gaining access by being a passenger or chaperone during a school trip can result from an AND gate scenario. The FT also shows that along with access to a school bus, the insider would also need a knowledge of security inspection protocols to place the device in an area where detection would be difficult. These coexisting events, as illustrated in Figure 3, highlight the importance of security measures that generate AND gates. Generating AND gates can enhance security within a system through layers of security and overlapping security features.

The scenarios depicted in Figures 2 and 3 suggest the importance of security inspection protocols for school buses. Using FTA, it can be determined that combining school bus security inspections with additional security measures—such as security policies, training, and physical barriers—would further enhance security. The use of FTA is an appropriate security design tool as it displays system vulnerabilities, shows how security enhancements might impact an entire system, and potentially guides the implementation of security regulations for school buses. Mandatory school bus security regulations that use a multi-faceted approach focused on security inspections, training, physical barriers, and security plans will help to mitigate the opportunities for threats to materialize.

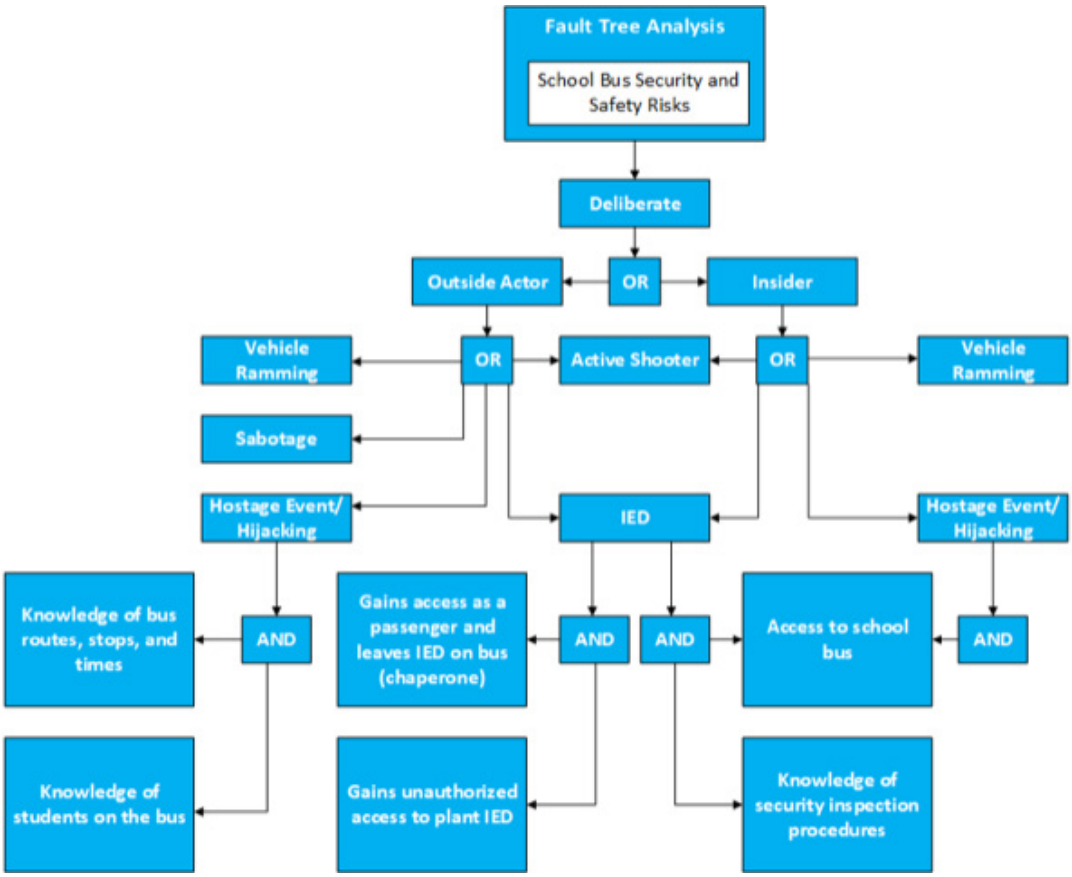

Figure 3. Use of an AND Gate in a School Bus Fault Tree

In terms of school buses, FTA does have some limitations, specifically concerning deliberate threat vectors. Security professionals, intelligence analysts, and school bus personnel are aware of previous threats and attacks, both non-deliberate and deliberate. However, they do not know all of the threats to school buses, specifically deliberate threats. Some non-deliberate threats can be anticipated or forecasted more easily, especially regarding weather events and natural disasters, while terrorist organizations and lone actors are continually seeking new attack methods. The defenders may not be prepared for the next threat vector.

Nonetheless, utilizing FTA on school bus systems will provide a proactive look at the system and identify where vulnerabilities lie. Assessing vulnerabilities is crucial in allocating resources to combat potential threats. FTA may lead a company to enhance physical security measures, such as fencing and access control systems, or implement a

security training program that prepares employees for responding to an incident or looking ahead to stop an incident from occurring. FTA may not alleviate all potential areas of exploitation, but realizing where current vulnerabilities exist will allow for mitigation techniques to reduce the risk of a debilitating incident occurring in the school bus system. Reducing this risk will subsequently enhance the system's ability to achieve a maximum level of performance.

Recommendations and methods to defend against the potential attacks described in Figures 2 and 3 are discussed in more detail in Chapter V. The FT methodology discussed in this chapter highlights the threats that would significantly weaken the performance measures of school bus transportation. Each aspect is best mitigated through security regulations. Regulations that cover security plans, training, drill and exercises, physical security, technology, inspection and testing protocols, and driver background checks provide mitigation strategies at every level of a school bus organization and foster a security culture.

C. AVIATION SECURITY FRAMEWORK

Regulations have helped drive the performance of the aviation industry since 9/11. A measure of performance for the aviation industry is transporting passengers from one airport to another safely and securely. If an FT was created to represent threats and methods to prevent attacks, the Transportation Security Administration (TSA) checkpoint and baggage screening would be some of the most critical parts. The following section on aviation discusses how regulations have framed the security network in the aviation industry and resulted in meeting performance measures over the last 17 years.

The Aviation and Transportation Security Act of 2001 created TSA and provided the framework for its security operations and oversight. Federal transportation security regulations focus primarily on the aviation industry, and TSA spends the majority of its budget on security screening and aviation compliance activities. The Federal Aviation Administration reports more than 42,000 flights and 2.5 million passengers traverse

American airspace every day.[218] This number pales in comparison to the number of passengers that utilize all other American modes of transportation on a given day. As previously discussed, the school bus industry transports over 50 million children every day. TSA's Surface Compliance Branch (SCB) has been tasked with enhancing the security of all other modes of transportation. Regulatory inspectors, known as surface inspectors, from the SCB have one federal security regulation, 49 C.F.R. § 1580, crafted to mandate specific security steps that freight and passenger railroads must implement. Agencies from other modes of surface transportation—school bus, ferry, pipeline, over-the-road bus, or trucking among others—work with TSA and surface inspectors on a voluntary basis.

The response to the 9/11 attacks has led TSA and the U.S. government to vow never to let a similar attack happen again. Transportation security officers staff virtually every American airport, and TSA's aviation inspectors have approximately 10 federal security regulations at their disposal to enforce security programs at U.S. airports and security checkpoints and on aircraft. Aviation security regulations cover airport operators, aircraft operators, passengers, employees, vendors, and anyone else who requires access to commercial airports and aircraft.

Title 49 of the *Code of Federal Regulations*, §§ 1540–1562, detail the full security responsibilities of the individuals and entities that engage aviation transportation.[219] Some sections offer specific guidance on how to carry out security to follow these regulations. For example, § 1540.111 explicitly states that individuals are not permitted to carry weapons, explosives, or incendiaries when submitting to security screening, accessing the sterile area of an airport, or boarding an aircraft. While there are certain exceptions to this part of the regulation, such as for authorized law enforcement officers, it is clear that these items are prohibited from commercial air travel. TSA posts a list of prohibited items on its website, so individuals can be prepared before arriving at the airport.

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[218] "Air Traffic by the Numbers," Federal Aviation Administration, accessed July 12, 2018, https://www.faa.gov/air_traffic/by_the_numbers/.

[219] 49 C.F.R. §§ 1540–1562 (2010).

Section 1542.207, which covers access control systems instituted by airport operators, sets a minimum standard but does not explicitly prescribe how an airport operator achieves it. This regulation mandates that airports give only authorized individuals access to secured areas, have a measure to immediately withdraw an individual's access to these areas when she no longer has authorization, and differentiate among individuals who may have different levels of access to certain secured areas. TSA does not regulate how an airport accomplishes these tasks, but it performs inspections to ensure the minimum standards are being met. Airport operators must create an airport security plan, which details how their organization will ensure compliance of these regulations, and submit it to TSA for approval.

The transportation security regulations (49 C.F.R. § 1500) set minimum standards. Aircraft operators are responsible for securing their aircraft and sensitive security information within the sterile area of an airport. Security threat assessments and criminal history record checks must be conducted on employees who handle air cargo. Security-specific training and retention of training records are required for all employees with airport and aircraft access. Foreign air carriers are required to create and submit a model security program that details how all of their security processes and training programs meet the same standards to which American domestic air carriers are held. Indirect air carriers, which facilitate the shipment of cargo on aircraft, and certified cargo screening facilities do not necessarily have direct contact with an airport or aircraft. The services they provide by screening and shipping air cargo require that they meet certain security standards to ensure air cargo is free of prohibited items and that the chain of custody is not broken from the time the cargo leaves their facility to its loading on an aircraft. General aviation airports and flight schools are not part of the commercial aviation system, but their employees and students are held to minimum security standards regarding training, background checks, and watchlist matching. Private flights, which do not always have the same TSA security standards as commercial flights, are required to follow many additional TSA security requirements when their flight plans include a scheduled arrival in the Washington, D.C., metropolitan area. Lastly, all air carriers listed in 49 C.F.R. § 1560 must meet the Secure Flight Program standards for watch list data and matching.

Whereas aviation transportation security regulations are extensive, surface transportation security regulations, especially within the school bus industry, are not. All aspects of aviation security have been put in place, and TSA ensures that its implementation complies with the minimum standards of the federal transportation security regulations. TSA has the authority to issue civil financial penalties to any individual or entity that fails to comply with these security regulations. Given that surface modes of transportation, specifically school bus transportation, are responsible for transporting more than 10 times the number of aviation passengers on a daily basis, it is time that additional measures are enacted. Surface modes of transportation should begin to align with the security standards that have been set for the aviation industry.

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V. REGULATION RECOMMENDATIONS

As the recent surge of school shootings has led to demands for increased security at schools, these heinous acts should be addressed immediately through the enactment of security regulations. Creating regulations will require schools and school bus companies to implement mitigation strategies to protect students at schools. As detailed in Chapter III, the Israeli government instituted laws to use IDF soldiers to protect school children on transit systems following the 1974 Palestinian attack on an Israeli school. Israel's and India's laws have also drastically limited an individual's ability to access a school, through fencing and security guards. These are potential strategies that could be brought to American cities that may be experiencing safety and security concerns for their students in their daily commute to and from school. Obviously, it would be nearly impossible to put American military and police personnel on every mass transit conveyance in the country. However, using regulation to ensure this type of visual deterrent is employed on a random basis would create a more secure environment for children during their commutes.

While many school bus companies and governments, both domestically and abroad, are making great strides toward security, many others throughout the United States are still not doing enough. Protecting American schools does not stop at the school's property line; it needs to be carried all the way to school bus operations. American school buses have not seen the same level of attacks as experienced overseas. However, incidents such as the Chowchilla, California, and Dale County, Alabama, kidnappings demonstrate that threats persist. There are numerous reasons for the lack of security on school buses, but ultimately, the most significant impediment is the lack of security requirements. The best way to mitigate these threats is to get all school bus operators to implement a minimum standard of security. That minimum standard ought to be defined by a set of transportation security regulations. Leveraging security regulations would create a minimum standard that all school bus companies and operators would be mandated to achieve.

While additional security regulations enacted by Congress may not be the most popular course of action, they would not be unprecedented for surface modes of transportation. The freight and passenger rail industries are regulated by 49 C.F.R. § 1580,

which requires those carriers to report certain security concerns, track and verify the chain of custody on hazardous chemical shipments, and maintain points of contact that are always available to TSA. Currently, additional regulations have been proposed that would expand security requirements by compelling freight and passenger railroads, mass transit systems, and over-the-road bus operators to develop a security training program.[220] School bus operators have not been included in these regulations, allowing those agencies the freedom to implement as much or as little security as they would like.

Potential security regulations for school bus agencies should mirror the robust, homogenous regulations already in place for the aviation industry and build on the initial regulations developed for the surface transportation industry. Creating transportation security policies has begun in the United Arab Emirates (UAE). Officials there have recognized the school bus industry has been limited to safety regulations and begun to incorporate security into their safety plans.[221] This was a smart decision and did not necessarily require much work to implement as safety and security plans often go together.

A. SECURITY PLANS

First and foremost, security regulations for school bus operators need to focus on the development of security plans. Security plans create the basis for policies, programs, and controls for security implementation throughout an agency.[222] Comprehensive security plans for school bus and other transportation organizations, should at a minimum focus on four main areas: management and accountability, personnel security, facility security, and vehicle security.[223] The U.S. Department of Transportation (DOT) asserts that recognized security plans lend agency credibility and demonstrate a commitment to the safety and

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[220] Libby Bloxom, "TSA to Issue Final Rule for Security Training for Transit, Freight and Bus Employees Summer 2018," Holland & Knight, January 31, 2018, https://www.hklaw.com/transportationblog/tsa-to-issue-final-rule-for-security-training-for-transit-freight-and-bus-employees-summer-2018-01-31-2018/.

[221] Ruiz, "School Bus Safety Should Be Taught at Home."

[222] "What Is a System Security Plan?," UAB Research, accessed July 13, 2018, http://www.uab.edu/research/administration/offices/OSP/FAQ/Pages/What-Is-System-Security-Plan.aspx.

[223] Henry Budhram, "Mass Transit BASE Program" (presentation, Transportation Security Administration, June 4, 2013).

security of passengers and employees.[224] The DOT explains that security planning allows an agency to identify organizational security strengths and weaknesses. The FTA in the previous chapter depicts a variety of potential threats that school bus companies face. By using this methodology in conjunction with security plans, a school bus company can analyze where their weaknesses are and build security plans and training material that target known weaknesses. The DOT also indicates that sharing approved security plans with external coordination among federal, state, and local response agencies helps to foster relationships and provides those external agencies with advanced knowledge of the transportation system.[225] Any advanced knowledge that first responders have about a transportation system has the potential to enhance their response capabilities during a security incident. When dealing with school buses and children, any advantages available to responders could be significant in avoiding tragedy.

B. TRAINING

Upon the creation of a security plan, school bus companies should begin training all agency employees on every aspect of the agency's security program. While many agency employees may not have a specific security role, their participation in security functions may become necessary during a security incident. Requiring security training for all employees enables individuals to serve in a variety of capacities during a security incident—or at least until someone better equipped, or hired explicitly for security purposes, can intervene. Training may also provide school bus employees with a better understanding of potential threats, which may help guide their response during certain security incidents. As described earlier, mandatory security training, especially for drivers involved in bus security inspections, is already underway in Turkey and Qatar.

TSA's proposed security training rule should be expanded to cover school bus operators. Individuals with security responsibilities who have not been appropriately trained increase vulnerabilities and liability for an agency. TSA's proposed training

[224] U.S. Department of Transportation, "The Public Transportation System Security and Emergency Preparedness Planning Guide," *Disaster Prevention and Management: An International Journal* 12, no. 4 (October 2003), https://doi.org/10.1108/dpm.2003.07312dab.005.

[225] U.S. Department of Transportation.

regulations, 49 C.F.R. § 1582 and § 1584, restrict untrained employees from performing sensitive security functions and detail the types of training materials that employees should receive. According to these regulations, all employees with security responsibilities should receive training to recognize suspicious or dangerous items and suspicious behavior from individuals, not to mention training detailing the aspects of a transportation system that may be vulnerable to terrorists.[226] From the FT in Figure 3, it appears preventing unauthorized access to a school bus helps to mitigate opportunities for an individual to place an improvised explosive device (IED) or suspicious item on a bus. This is an area that can be addressed through training employees about suspicious activity around school buses and challenge procedures in the event they encounter a suspicious person in a bus yard or maintenance facility. Along with mandating the training material described in these regulations, school bus companies should participate in advanced security training courses. There are many advanced security training opportunities, but some examples areas include cyber security, active shooters, incident command systems, and behavioral analysis. TSA offers a variety of training programs that can supplement individual agency security training programs. TSA has utilized transportation security specialists in explosives to provide in-depth training on IEDs, field intelligence officers can offer modal-specific threat intelligence briefings, and transportation security inspectors facilitate TSA's First Observer Plus program. Educating school bus agencies in basic security principles creates vigilance and domain awareness. This knowledge will be the foundation for school bus employees to deter security threats proactively.

TSA is not able to mandate that school bus agencies provide security training to public citizens or even their students, but potentially offering school bus security awareness training to these groups could be a great use of community engagement and partnerships. Offering this type of training to the community is a way to add an additional layer of security to school buses, and it allows the community to take ownership of protecting the children. Charles Poland and the sixth grader in Campo, California, demonstrated profound courage in helping to protect many students from harm. Bravery like this, coupled with

[226] Transportation Security Administration, "Security Training for Surface Transportation Employees," 81 Fed. Reg. 242 (December 16, 2016).

school bus security-awareness training programs across the country may save lives and prevent future incidents like these.

C. DRILLS AND EXERCISES

Drills and exercises are an expansion of security training. In order for school bus agencies to assess the feasibility and success of their security plans and training programs, they must be tested. Current and proposed transportation security regulations, within the surface modes of transportation, do not compel agencies to participate in drills and exercises, but precedents for mandating security drills and exercises exist. For example, 33 C.F.R. § 104.230 outlines the U.S. Coast Guard's authority to require vessel personnel with security functions to participate in an annual exercise testing their knowledge, skills, and ability to administer proper maritime security and vessel security plan procedures.[227] Section 104.203 explains that these drills and exercises can be discussion-based, such as in a tabletop exercise, or take the form of functional, full-scale operation-based exercises. Along with defining the types of acceptable exercise styles, the Coast Guard dictates that "each exercise must test communication and notification procedures, and elements of coordination, resource availability, and response."[228] Airports and aircraft operators are also obligated, by 49 C.F.R. § 1542, 1544, and 1546, to participate in similar forms of drills and exercises annually, with their target objectives defined by regulation as well.[229]

TSA's Exercise Information System (EXIS) is a free and voluntary discussion-based tabletop exercise program in which surface transportation stakeholders can elect to participate. EXIS is wholly funded and facilitated by TSA. Stakeholder participation begins with TSA designing and facilitating a tabletop exercise for agency personnel that focuses on security plans, policies, and implementation of procedures. Upon completion of the tabletop exercise, participants are given access to TSA's EXIS interface, which allows individuals and agencies to create their own discussion- or operations-based transportation

[227] Drill and Exercise Requirements, 33 C.F.R. 104.230 (2005), https://www.law.cornell.edu/cfr/text/33/104.230.

[228] Drill and Exercise Requirements.

[229] 49 C.F.R. § 1542.213, 1544.235, 1546.407 (2010).

security exercises by guiding them through the exercise development process.[230] Participation in drills and exercises will help school bus companies identify additional gaps in their security programs and implementation strategies. Senior officials often develop plans and strategies without the input of frontline personnel. However, when frontline personnel are involved in exercise events, they can communicate the strengths and weaknesses derived from the application of security plans. If the implementation of security plans is unproductive, frontline personnel, such as bus operators, can be a great resource in identifying procedures that might be more effective in enhancing security. It is critical that exercises be used and viewed as a tool to generate improvement within an agency. School bus agencies should participate in exercises designed with potential real-world security events to see how their security plans fit and respond to changing scenarios. Drills and exercises should be designed with an understanding of where an agency's potential security vulnerabilities lie, which provides an opportunity to develop proactive and effective solutions to address them.

D. PHYSICAL SECURITY

Transportation workers who are supported with strong security plans and security training programs offer an invaluable measure of security to the system in which they operate. However, an educated and prepared workforce needs supplementing with physical security measures to enhance the overall security of a transportation system. Just as the aviation industry is required to have access control systems in place, school bus agencies should begin installing access control systems at their facilities. Security regulations addressing minimum access control requirements for school bus entities should be enacted.

School bus entities should develop effective access control methods for their operations, and TSA would determine whether the implemented measures are sufficient to restrict access to unauthorized individuals. The FTA in Chapter IV helps to inform the implementation of those areas of security. Several of the potential attack methods analyzed show that preventing access to school buses is crucial in mitigating threats. If access to the

[230] "Exercise Information System," Transportation Security Administration, December 5, 2016, https://www.tsa.gov/for-industry/exercise-information-system.

system is reduced through the use of physical security features, the attacker has fewer opportunities to harm the system.

Fundamental features for access control include fencing, gates, locks, key control policies, and identification badges, to name a few. School bus entities need to develop effective security measures to keep unauthorized individuals away from their critical assets such as school buses, bus garages and depots, dispatch centers, and maintenance facilities. Access control measures prevent unauthorized access, but they also allow for school bus entities to house all of their school buses at central locations, as STS did, eliminating the need for drivers to take their buses home at the end of their shifts. Parking school buses at personal residences adds an unnecessary vulnerability as the potential for unauthorized access and nefarious acts against the school bus increases.

Requiring employee identification badges is a relatively cheap and effective access control procedure. Directing school bus companies to institute identification badge requirements, coupled with challenge procedures, places security responsibilities on all employees and promotes vigilance among the workforce. Surface transportation stakeholders frequently occupy large parcels of land, primarily to store vehicles, which increases the likelihood of unauthorized individuals accessing their facilities. Identification badge policies that expressly state identification should be displayed on a person's outermost garment above the waist offer an observation target for employees when they encounter people on company property. Individuals failing to display a badge should be challenged about their purpose for being on the property and escorted off the property or to a public company area. Any unbadged individuals with a need to be on school bus property should remain under escort until their business has been completed. Identification badge, challenge, and escort procedures offer low-cost measures that add a significant layer of security to school bus facilities.

E. INSPECTION AND TESTING

Once plans, procedures, training, exercises, and physical security measures have been implemented, they need to be tested to verify their effectiveness. As in the aviation industry, TSA will have the authority and duty to inspect these agencies to ensure

compliance with the training regulations. Compliance will be determined through the inspection of agency training programs and materials, as well as the verification of training logs detailing employees who have received security training.[231] Many school bus companies are already required to offer training sessions to their employees; adding a security training and inspection component to the curriculum should pose no undue burden on the agency or its operations.

School bus companies need to conduct testing to verify that these plans and programs are working effectively and efficiently. Aviation regulations require that testing be conducted throughout the airport environment, and those concepts can be brought to the school bus industry as well. TSA surface inspectors should be responsible for inspecting and administering the tests, much like their aviation counterparts do with their industry stakeholders. Mandatory TSA testing sets the standard for meeting compliance objectives and fosters a minimum level of security throughout the entire industry. Individual school bus agencies that conduct their own additional testing raise the bar for the rest of the industry by displaying a proactive security approach. A robust internal security testing program empowers employees to take ownership of their role in providing safety and security to the students they transport. It also demonstrates to the public, school administration, teachers, parents, and students a level of commitment to security during a time in which horrific acts of violence have been carried out against American school children.

Identification badges as well as challenge and escorting procedures can all be tested by a TSA inspector accessing a facility and walking through its secured area without identification displayed. Such a test should elicit a response from a school bus employee, who ideally challenges the inspector as to her purpose at the facility and lack of identification. Successfully observing, challenging, and escorting the inspector back to a public area—unless testing is scheduled to continue—would constitute a passing test. Additionally, asking employees a series of security-related questions—pertaining to their agency's security plans, procedures, and implementation guidance—tests not only the

[231] Transportation Security Administration, "Security Training for Surface Transportation Employees."

individual's security knowledge but also the agency's ability to ensure their employees are properly prepared for security duties.

School bus inspection protocols should be explicitly annotated in agency security plans and procedures, and drivers should receive the training necessary to perform these functions. Assessing pre- and post-trip inspections, as well as inspections whenever a school bus has been left unattended, is perhaps the most critical form of testing. These tests gauge a driver's security competency, vigilance, and ability to ascertain whether certain items on a bus are suspicious. A cell phone or book left on a seat is unlikely deemed suspicious; however, a backpack that appears to be purposefully concealed under a seat directly above the wheel well should raise suspicions. Based on the FTA, effective inspections could lead to the discovery of a device or suspicious item. If access cannot be controlled, the inspection process is necessary to proactively search the school bus to ensure no suspicious packages have been placed or hidden on the bus.

TSA surface inspectors would be responsible for hiding various weapons or IED simulants in locations on the bus that a driver ought to encounter during the three types of security inspections. These items should be clearly marked as testing tools to ensure that school bus personnel do not engage law enforcement during the controlled security test. It should be noted that in a real-world, non-testing security incident, the notification of law enforcement personnel should be part of the agency's security response plan. Discovery of these items should trigger a security response. Potential responses include notifications to senior agency security officials, which may trigger the evacuation of the bus. These response protocols should be detailed in the agency's security plan, and all drivers should be adequately trained on the notification and response procedures. Passing this test would entail the discovery of the item followed by agency notification and response procedures.

F. TECHNOLOGY

To date, federal transportation security regulations have not required specific advanced technological systems to monitor or enhance security. Some of the regulations are written so that technology is the most efficient way to operate a portion of a security program. However, they do not necessitate that agencies expand their security technologies

beyond common industry standards. Global positioning systems (GPS) and closed-circuit television (CCTV) systems are becoming an industry standard for school buses, and future security regulations should reflect that to ensure all school buses without GPS or CCTV are either retrofitted or removed from service. The UAE requires CCTV cameras on its school buses, and India mandates "sensor" technology. This affords parents and students the security of knowing there is a system in place to monitor students traveling to and from school. These policies are designed to protect students while also ensuring that school bus companies and school officials are held accountable when they fail to meet requirements. Implementing these digital technologies is where federal transportation security regulations should diverge from their typical practice of not requiring industry stakeholders to install advanced security technologies. While they may be costly to install, CCTV, GPS, and radio frequency identification (RFID) are invaluable tools for providing security and peace of mind. GPS is able to track the movement and location of the school bus but does not offer pinpoint locations for individual students. RFID cards or chips supplement GPS by offering a wide variety of data and location points for parents, students, school bus companies, and school systems. Swiping an RFID card upon entry or exit of a bus can enable a push notification to wireless devices utilizing an associated application. The information stored on an RFID card can provide a location of the student holding it and allow schools and school bus drivers to positively match a child with adults who have been officially designated for pick-up. Drawbacks of this technology have been outlined in Chapter III, but this type of technology offers parents and guardians peace of mind in knowing they can track their child's location. RFID technology reduces the likelihood of a child being released to an unauthorized individual.

A report by Kajeet Incorporated describes the technological advancements that can effectively enhance the safety, security, and productivity of students. The Kajeet SmartBus centers around the use of a wireless router to operate technological systems such as GPS, surveillance cameras, RFID, driver tablets, and telematics (see Figure 4).[232] In addition to these security features, telematics allows for tracking of all bus activities and provides

[232] Kajeet, *The Connected Bus: 8 Technologies for the Next Generation School Bus* (McLean, VA: Kajeet, 2018).

alerts when tire pressure is low or the engine is performing at sub-optimal levels.[233] Kajeet explains that students spend an average of 40 minutes per day on a bus, which equates to approximately 120 hours per year, given a 180-day school year.[234] With that much time on a bus, additional smart bus technology not only improves security but also increases student productivity as they can connect their wireless devices to the onboard Wi-Fi and work on school assignments.[235] Turning school buses into smart buses aligns with the digital transformation that is ongoing throughout the world. A regulation mandating advanced technology systems, such as smart bus technology, would be a bold move that may be difficult to implement fully due to privacy and cost concerns, but it is a necessary step to continue the effort in protecting American schools and school transportation.

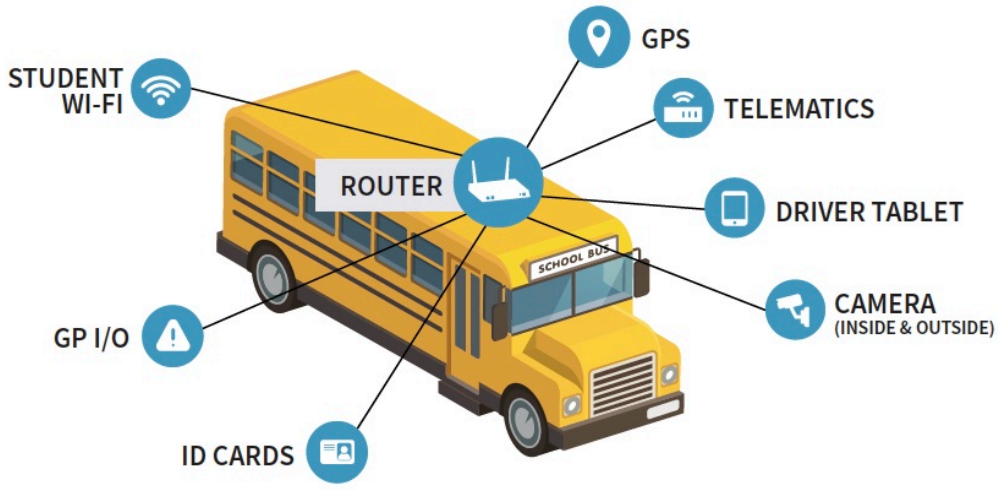

Figure 4. Smart School Bus Technology[236]

[233] Kajeet, *The Connected Bus*.

[234] Kajeet.

[235] Kajeet.

[236] Kajeet.

G. BUS DRIVER REQUIREMENT

Ultimately, the safety and security of children while they are on the school bus is in the hands of the school bus driver. Regardless of the security plans, training, physical measures, and testing protocols, the school bus driver is likely the first person to encounter a security incident, and their ability to respond is critical to ensuring the security of the students on board. While the FTA in Chapter IV did not specifically address driver actions, the illustration suggests that school bus drivers could play critical roles in several of the potential attack methods. Whether it be a hostage/hijacking event or a deliberate crash of the school bus, if the proper drivers are not hired, screened, and trained, the system is at risk of failure. School bus drivers are at the forefront of school bus security, and it is imperative that they are ready and capable of handling their security responsibilities.

A 2012 RAND Corporation study of the Qatari government recommended a universal licensing process for drivers handling school children.[237] Research into the area of American school bus driver background checks has suggested that, at best, the process lacks uniformity and, at worst, is unsatisfactory. Transportation security regulations governing aviation security encompass standards for background checks for everyone. For example, aviation employees, at a minimum, undergo a criminal record check, security threat assessments are conducted on all individuals handling air cargo shipments, and passengers are all vetted through Secure Flight prior to proceeding through the security checkpoint.

Hiring and verification standards for potential school bus drivers are not stringent enough in many locations. The driver's records checks of the Registry of Motor Vehicles are insufficient in vetting the individuals who will be responsible for taking children to and from school. Craigslist has seen trouble for some of the shady dealings that occur on its website, yet many school bus companies advertise job announcements on the platform. This is not to disparage the individuals who use Craigslist's service, but there are more reputable avenues for advertising job openings that have the potential to draw a more qualified applicant pool. TSA would regulate the background check process by inspecting

[237] Younossi et al., "Qatar's School Transportation System."

the hiring and background check records retained by the hiring school bus agencies. Regulating this aspect of the school bus industry and ensuring annual recertifications of employee background records will lead to a more professional and reliable staff of school bus drivers across the nation.

In addition to universal background checks for bus drivers, school bus companies and school districts might consider approaching bus driver fitness as does the Federal Aviation Administration (FAA). According to aeronautics and space regulations (14 C.F.R. § 67), all airline pilots are required to undergo a yearly medical evaluation, which includes a mental assessment, to determine whether they are fit to retain their FAA certificate.[238] CBS News points out that a medical doctor conducts this evaluation, and it does not include a psychological test.[239] Former FAA administrator Michael Huerta explains that the medical and health assessment offers a better representation of mental health as the psychological test captures only one's mental state at the moment.[240] Obviously, school bus drivers must be physically capable of operating a bus, but their mental stability is even more important. Similar to an airline pilot, a school bus driver is in control of the vehicle. If school bus drivers are not mentally fit to operate a bus and handle their interactions with children, security measures will not matter. In the case of a mentally unfit driver, the threat is already steering the bus.

India does not assess the mental fitness of its school bus drivers; however, India mandates that all drivers have limited interaction with the students while operating the vehicle. The majority of interactions with students is handled by the "lady attendant" who occupies each bus.[241] This individual is the equivalent of the American bus monitor. Additionally, all Indian bus drivers are required to keep a list containing personal information about students such as their names, addresses, and guardians to which they are

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[238] Medical Standards and Certification, 14 C.F.R. 67 (2005), https://www.ecfr.gov/cgi-bin/text-idx?SID=6806930837a0658be361c1bf02786299&mc=true&node=se14.2.67_1107&rgn=div8.

[239] Associated Press, "FAA Rules Out Requiring Psychological Testing for Airline Pilots," CBS News," June 9, 2016, https://www.cbsnews.com/news/faa-rules-out-requiring-psychological-testing-for-airline-pilots/.

[240] Associated Press.

[241] "CBSE Increases Students' Security."

released.[242] This philosophy may not address potential mental illnesses of bus drivers in India, but it does offer a barrier between the driver and the students, which could lead to a reduced stress level for the driver.

H. CONCLUSION

There are many potential areas to be regulated within the school bus transportation industry. Once these regulations are implemented, they must be enforced, much like what is done in the American aviation industry and in India with its ability to levy civil penalties or fines when school bus companies or school officials ignore security regulations. This places the accountability on those agencies to ensure they are providing adequate security for the children using the transportation system. Security regulations certainly come with a cost; however, according to a 2012–2013 study conducted by the National Center for Education Statistics, the cost of transporting students is relatively low. Despite transporting over 50 million students daily, the cost of doing so per student is approximately $950 annually (using adjusted 2014–2015 figures). Basing that on a 180-day school year, the cost per child is just over $5 per day (see Table 1). In the grand scheme of things, that cost is minimal. A slight decrease in spending in certain areas, such as contract fees school bus companies pay to school districts, may free up money to be allocated for additional security. For school districts, a slight increase in public taxes or a change in appropriating money could also lead to additional funds to enhance security.

[242] Track School Bus, "India."

Table 1. Yearly Cost per Student to Ride the School Bus[243]

Students transported at public expense and current expenditures for transportation: Selected years, 1980–81 to 2012–13

School year	Students transported at public expense (number)	Students transported at public expense (percent of total)	Expenditures for transportation (in thousands)[1] [In unadjusted dollars]	Average expenditure per student transported [in unadjusted dollars]	Expenditures for transportation (in thousands)[1] [in constant 2014–15 dollars]	Average annual expenditure per student transported [in constant 2014–15 dollars]
1980–81	22,272,000	59.1	$4,408,000	$198	$12,043,547	$541
1990–91	22,000,000	57.3	8,678,954	394	15,338,672	697
1999–2000	24,951,000	57.0	13,007,625	521	18,185,182	729
2000–01	24,471,000	55.5	14,052,654	574	18,995,386	776
2001–02	24,529,000	55.0	14,799,365	603	19,656,715	801
2002–03	24,621,000	54.7	15,648,821	636	20,338,019	826
2003–04	25,159,000	55.5	16,348,784	650	20,792,839	826
2004–05	25,318,000	55.5	17,459,659	690	21,556,975	851
2005–06	25,252,000	55.0	18,850,234	746	22,420,081	888
2006–07	25,285,000	54.8	19,979,068	790	23,163,673	916
2007–08	25,221,000	54.6	21,536,978	854	24,077,748	955
2008–09	—	—	21,679,876	860	23,903,735	948
2009–10	—	—	21,819,304	870	23,826,919	950
2010–11	—	—	22,370,807	888	24,429,167	970
2011–12	—	—	22,926,700	905	24,543,381	969
2012–13	—	—	23,233,698	914	24,164,005	950

[243] "Fast Facts," National Center for Education Statistics, accessed October 16, 2018, https://nces.ed.gov/fastfacts/display.asp?id=67.

American parents are willing to spend thousands of dollars every year for their children to participate in clubs, travel, or Amateur Athletic Union sports teams.[244] It is not unreasonable to think or expect that parents would be able to pay slightly more than the $5 per day that it costs to transport their children on the school bus. Increasing the transport cost of students through regulations for enhanced security measures is necessary to mitigate the risks that face school bus transportation.

The United States has the most comprehensive school bus transportation system in the world, but more can be done. Despite not having much of a school bus transportation system in place, China has developed a smart practice for school bus security. China recognizes that its school transportation system is virtually nonexistent, and it is in the process of trying to adopt the school bus transportation and security systems of other countries.[245] While China may not have a sufficient school bus security strategy, the country understands that one is necessary to protect its students. Establishing a uniform policy throughout the country—by borrowing strategies from established programs and measures—is something that other countries around the world should be doing to mitigate security threats. China is looking to adopt best practices from wherever it can get them. This is a strategy that the United States should be using as well. The American school bus transportation system is flawed, and the United States should seek ways to improve the security of children on school buses.

The areas discussed in this chapter and the FTA in Chapter IV point to the benefits of regulation for transportation security. A chain is only as strong as its weakest link, and the same is true for school bus security. When school bus companies and school districts are each playing by a different set of rules, inevitably certain companies will fall behind. Enacting federal security regulations will ensure that every entity involved in school bus security has a baseline security standard to achieve. This standard will then be subject to inspection to ensure compliance. Aviation security has successfully used the same methodology since 9/11. The use of security regulations is the most effective and efficient

[244] Jason Smith, "Paying to Play: How Much Do Club Sports Cost?," *USA Today*, August 1, 2017, https://usatodayhss.com/2017/paying-to-play-how-much-do-club-sports-cost.

[245] Fei, "On the Road to Safe School Transport in China."

means to ensure that entire systems are taking the necessary steps to provide an acceptable level of security for the individuals using them.

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VI. CONCLUSION

The school bus transportation industry is a critical piece of infrastructure that should provide safe and secure transport for every child every day. Throughout the world, and specifically in the United States, there has not been a high volume of attacks or security incidents involving school buses. The lack of significant incidents does not suggest there is no threat; school buses remain a soft target. Osama bin Laden suggested that an attack against American children would cause the most significant amount of destruction, panic, and fear. Attacks against mass transportation systems in London, Madrid, and Brussels unequivocally prove that civilian mass transit conveyances are prime targets for terrorist activity. Furthermore, the recent surge in domestic school violence highlights the legitimacy of the threat facing school children. Although the threat to school buses may not be imminent, it is real, and enhanced measures of security need to be brought to the school bus industry in an attempt to harden the target.

To address security vulnerabilities in the school bus transportation industry, this thesis detailed school bus security incidents from around the world, current effective security strategies, and an analysis of potential methodologies that can be adapted to suit the school bus sector. Assessing the desired performance of a system provides a baseline for implementing security procedures to maintain that performance level. Using methodologies such as risk analysis, game theory, the attacker-defender (AD) model, and FTA provides the system an opportunity to identify areas that are vulnerable to potential threats. The use of game theory, the AD model, and FTA helps to create scenarios that would cause a significant impact on a system, or possible worst-case events. Threats are always evolving, but using these approaches can lead to the implementation of proactive security measures designed to mitigate threats, vulnerabilities, and consequences.

These methodologies help to establish a framework for developing a solution to the current lack of school bus security standards in this country—the creation and implementation of federal security regulations. Since 9/11, the aviation industry has utilized federal transportation security regulations, along with improved technologies, to

make air travel the safest it has ever been.[246] TSA's current freight rail security regulations have been successful in tracking rail cars carrying toxic inhalation hazards (TIH) and reducing the time TIH materials are left unattended. A March 2009 progress report from Union Pacific Railroad revealed that the railroad saw a 98 percent reduction in dwell time of TIH rail cars after the security regulations went into effect.[247]

Even though the school bus industry is vast and encompasses many different entities, the execution of security regulations is still feasible. Based on the success of federal transportation security regulations in the aviation and freight rail industries, transportation security regulations for school buses will also be successful in increasing the overall level of security within the sector. Security in the aviation and freight rail sectors has provided a template from which the school bus sector can build. Instituting a multi-layered security approach that covers security plans and procedures, training, exercises, testing, physical measures, and technology will foster a focused security environment. A security atmosphere that engages people, programs, and technology allows for security engagement throughout a transportation system. Bringing security regulations to the school bus industry will help solidify another piece of the homeland security enterprise.

Security programs and measures within the transportation sector of the homeland security enterprise must work every time they are tested to provide safety and security to the traveling public. Meanwhile, those seeking to attack or cause harm to the system or children on a school bus have to succeed only once to create a tragedy that will live in infamy. To date, the security of the U.S. school bus transportation system has not been tested often, but the potential threat persists. The continued threat and the likely horrific consequences of an attack or catastrophic system failure pose enough of a risk to change the industry paradigm and formulate security regulations for school buses. Enacting federal security regulations for school bus transportation sends the message that the U.S. government is serious about protecting the thing we treasure most, our children.

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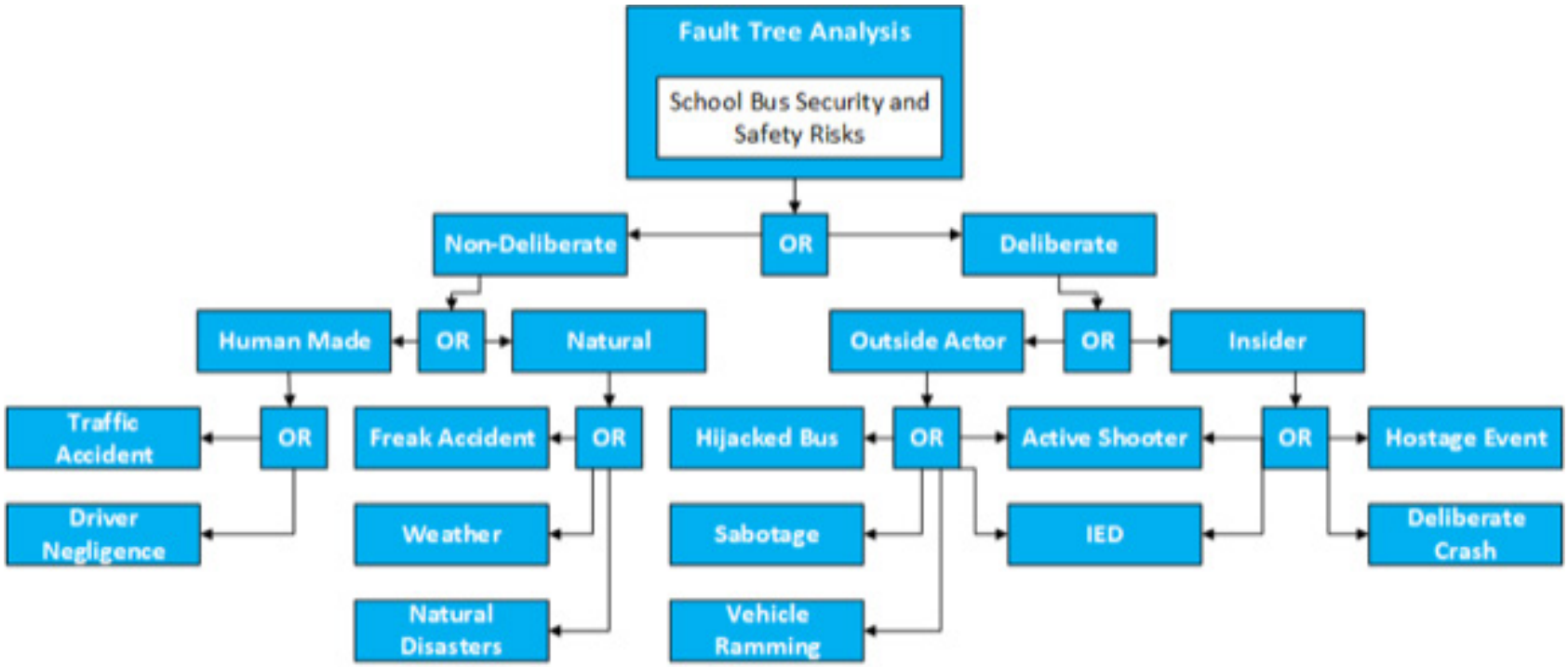
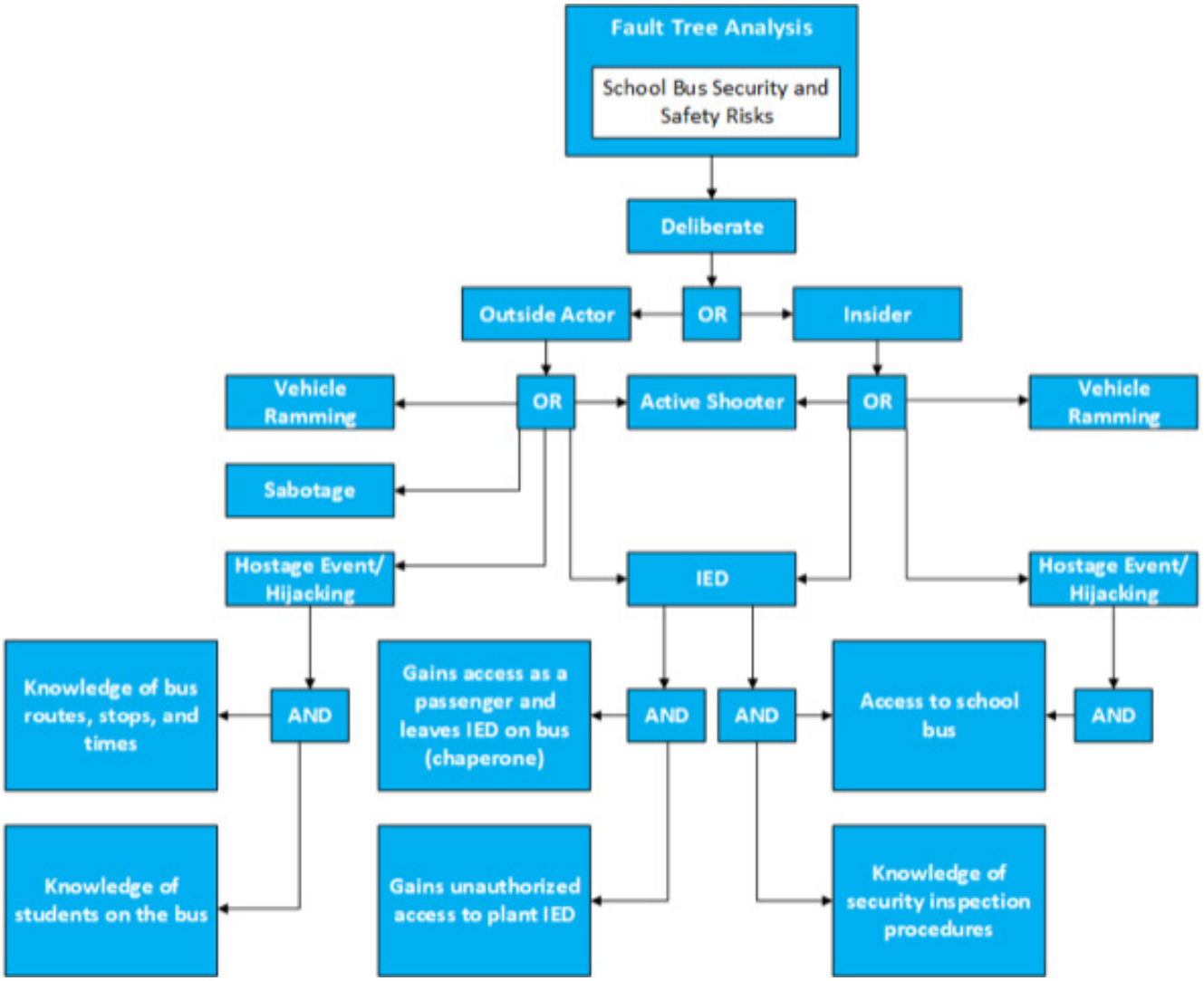
APPENDIX



Fault Tree of a School Bus System



Use of an AND Gate in a School Bus Fault Tree

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